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Final Environmental Impact Statement

Land and Resource Management Plan

Mt. Hood National Forest

Acronyms and Abbreviations Used in This Document

AMP	Allotment Management Plan
AMS	Analysis of the Management Situation
AQRV	Air Quality Related Value
ARP	Aggregate Recovery Percent
ASQ	Allowable Sale Quantity
ATV	All Terrain Vehicle
AUM	Animal Unit Month
BF	Board Foot
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
BMP	Best Management Practice
BPA	Bonneville Power Administration
BTU	British Thermal Unit
CEQ	Council on Environmental Quality
CF	Cubic Feet
CFL	Commercial Forest Land
CFR	Code of Federal Regulations
CMAI	Culmination of Mean Annual Increment
CRGNSA	Columbia River Gorge National Scenic Area
CRITFC	Columbia River Inter-tribal Fish Commission
DBH	Diameter at Breast Height
DEIS	Draft EIS
DEQ	Department of Environmental Quality (Oregon)
DFSIM	Douglas Fir Growth and Yield Simulator
DP-DFSIM	Dynamic Programing version oDouglas Fir Growth and Yield Simulator
EA	Environmental Analysis
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FEIS	Final EIS
FERC	Federal Energy Regulatory Commission
FMAZ	Fire Management Analysis Zone
FONSI	Finding Of No Significant Impact
FORPLAN	Forest Planning Model
FPFO	Forestry Program for Oregon
FS	Forest Service
FSH	Forest Service Handbook
FSM	Forest Service Manual
FY	Fiscal Year
GIS	Geographic Information System
HCI	Habitat Capability Index
ICO	Issues, concerns, and Opportunities
ID	Interdisciplinary
IDT	Interdisciplinary Team
IMPLAN	Input/Output Model
KGRA	Known Geothermal Resource Area
KV	Knutson-Vandenburg
LOD	Large Organic Debris
LRMP	Land and Resource Management Plan
LTI	Legal Trout Index
LTSY	Long Term Sustained Yield
LTSYC	Long Term Sustained Yield Capacity
M	Thousand
MA	Management Area
MAUM	Thousand Animal Unit Month
MBF	Thousand Board Feet
MCF	Thousand Cubic Feet
MIS	Management Indicator Species
MM	Million
MMBF	Million Board Feet
MMCF	Million Cubic Feet
MMRs	Minimum Management Requirements
MOM	Mature and OverMature
MOU	Memorandum of Understanding
MR	Management Requirement
MRVD	Thousand Recreation Visitor Days
MTHNF	Mt. Hood National Forest
MWFUD	Thousand Wildlife/Fish User Day
NA	No Action
NC	No Change
NDF	Nondeclining Flow
NEPA	National Environmental Policy Act
NF	National Forest
NFMA	National Forest Management Act
NPB	Net Public Benefits
ODFW	Oregon Department of Fish and Wildlife
ORC	Oregon Rivers Council
ORV	Off Road Vehicle
PAOT	Persons at One Time
PCNST	Pacific Crest National Scenic Trail
PL	Public Law
PM10	Particulate Matter less than 10 microns in size
PNV	Present Net Value
PNW	Pacific Northwest
PRIA	Public Rangelands Improvement Act
R6	Region 6 (Pacific Northwest Region, USDA Forest Service)
RAREII	Roadless Area Review and Evaluation II
RIM	Recreation Information Management
RM	Roaded Modified
RN	Roaded Natural
RNA	Research Natural Area
ROD	Record of Decision
ROS	Recreation Opportunity Spectrum
RPA	Forest and Rangeland Renewable Resources Planning Act of 1974
RVD	Recreation Visitor Day
S&G	Standard and Guideline
SCORP	Statewide Comprehensive Outdoor Recreation Plan
SEIS	Supplement to the EIS for an Amendment to the Pacific Northwest Regional Guide, Spotted Owl Guidelines.
SHCI	Smolt Habitat Capability Index
SHPO	State Historical Preservation Officer (Office)
SIA	Special Interest Area
SIC	Standard Industrial Classification
SMU	Streamside Management Unit
SOHA	Spotted Owl Habitat Area
SPM	Semiprimitive, Motorized
SPNM	Semiprimitive, Nonmotorized
SRI	Soil Resource Inventory
T&E	Threatened and Endangered
TSI	Timber Stand Improvement
TSP	Total Suspended Particulates
TSPQ	Timber Sale Program Quantity
USF&W	United States Fish & Wildlife Service
USDA	United States Department of Agriculture
USDI	United States Department of Interior
USGS	United States Geological Survey
VAC	Visual Absorption Capacity
VMS	Visual Management System
VQL	Visual Quality Level
VQO	Visual Quality Objective
WFUD	Wildlife & Fish User Day
WRS	Wilderness Resource Spectrum
WSR	Wild and Scenic River

Final Environmental Impact Statement

Land And Resource Management Plan

Mt. Hood National Forest

Multnomah, Clackamas, Hood River, Wasco, Marion and Jefferson Counties, Oregon

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Abstract

This Final Environmental Impact Statement describes and analyzes eight alternatives for managing the 1.1 million acres of land administered by the Mt. Hood National Forest. Based on public comment, all alternatives in the Draft Environmental Impact Statement have been modified and three alternatives B, D, and G have been dropped. They were dropped because there was little public comment received on some and the issues addressed by those alternatives were felt to be adequately addressed in other alternatives. Each of the alternatives responds differently to the major issues and concerns identified. Alternative NC (No change) continues management under the 1978 Timber Management Plan and approved Unit Plans without compliance with all the provisions of the National Forest Management Act of 1976 (NFMA) implementing regulations. Alternative A (No action) continues the management according to current plans and policies and is updated to meet NFMA requirements. Alternative C responds to the 1980 Forest and Rangeland Renewable Resources Planning Act (RPA) Program and emphasizes the production of commodity resources. Alternative E provides a balanced program and maximizes timber volume in the first decade by departing from nondeclining flow. Alternative F emphasizes scenic and recreational values. Alternative H retains existing old growth stands and maximizes dispersed recreation opportunities. Alternative I provides optimal habitat conditions for wildlife and fish.

Alternative Q is the Forest Service preferred alternative. The selected alternative will become the Forest Plan. It was developed in response to public comments received on the draft EIS and emphasizes a variety of high quality recreation opportunities, scenic values, and quality wildlife habitat, while managing timber and other resources to maximize public net benefits.

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Summary of the FEIS

Introduction

The Final Environmental Impact Statement (FEIS) discusses eight alternative strategies for management of the Mt. Hood National Forest, one of which is developed into the Land and Resource Management Plan (Forest Plan). The Forest Plan will be in effect and guide management of the Forest for 10 to 15 years, unless revised sooner. The analysis presented, however, covers a planning period of 50 years to evaluate and display long term effects. The Plan, when implemented, will assure multiple use, sustained yield and protection of Forest resources.

The Draft Environmental Impact Statement (DEIS) and Proposed Land and Resource Management Plan were released for public review and comment in January, 1988. This FEIS and Forest Plan were developed in response to those comments and incorporates many suggestions made by the public and other agencies. Changes that were made between the DEIS and FEIS are described throughout the document.

The Forest Plan for the Mt. Hood National Forest is contained in a separate document. The FEIS and Forest Plan are to be treated as companion documents.

The Forest Plan guides all natural resource management activities and establishes management standards and guidelines for the Mt. Hood National Forest. It describes resource management practices, levels of resource production and management, and the availability and suitability of lands for resource management.

The Forest Plan:

- Establishes Forestwide multiple-use goals and objectives;
- Establishes Forestwide standards and guidelines for future activities;
- Establishes management area direction, including management area prescriptions and standards and guidelines applying to future management activities in that management area;
- Establishes the allowable sale quantity for timber and identifies land suitable for timber management;
- Establishes monitoring and evaluation requirements;
- Establishes nonwilderness multiple-use allocations for the Olallie/Mt. Jefferson roadless area that was reviewed under 36 CFR 219.17 and not recommended for wilderness designation.

The Forest Plan embodies the provisions of the National Forest Management Act, the implementing regulations, and other guiding documents. Land use determinations, prescriptions, and standards and guidelines constitute a statement of the plan's management direction; however, the project outputs, services, and rates of implementation are dependent on the annual budgeting process.

The Forest Plan will be revised on a 10 year cycle, or at least every 15 years. It may also be revised whenever the Forest Supervisor determines that conditions or demands in the area covered by the Plan have changed significantly or when changes in policies, goals, or objectives would have a significant effect on Forest-level programs. The Forest Plan also may be amended.

This document is a general summary of the entire FEIS. It emphasizes the issues and concerns raised by the public and other local, State, and Federal agencies, regarding the management of the Mt. Hood National Forest. The summary will briefly describe the purpose and need for the FEIS, and give a brief description of the affected environment, the issues, the alternatives, and the environmental consequences of implementation of the alternatives.

Purpose and Need

The purpose of the Forest Plan is to direct all natural resource management activities on the Forest. Preparation of the Forest Plan is required by the Forest and Rangeland Renewable Resources Planning Act of 1974 (RPA), as amended by the National Forest Management Act of 1976 (NFMA), plus the associated National Forest System Land and Resource Planning Regulations (36 CFR 219).

The preparation of an Environmental Impact Statement disclosing a preferred alternative and a broad range of additional alternatives is required by the National Environmental Policy Act of 1969 (NEPA) and Council on Environmental Quality (CEQ) Regulations (40 CFR 1500).

The Forest Plan has been organized around some primary questions about forest management. These questions were raised by Forest Service managers, industry representatives, environmentalists, and others and became the Issues, Concerns, and Opportunities (ICOs) which directed the planning process.

The planning process specified in the NFMA implementing regulations and the Environmental Analysis process specified in the CEQ regulations were used in developing this FEIS and the accompanying Land and Resource Management Plan (Forest Plan). The planning steps employed are:

- Identification of purpose and need.
- Preparation of planning criteria.
- Inventory data and information collection.
- Analysis of the Management Situation.
- Formulation of alternatives.
- Estimated effects of alternatives.
- Evaluation of alternatives.
- DEIS with Preferred Alternative and Proposed.
- Plan released for public comment.
- FEIS completed and Plan approved; Record of Decision signed.
- Forest Plan implementation, monitoring, and evaluation.

The results of the Environmental Analysis are documented in this FEIS. The Environmental Analysis ensures that environmental information is available to public officials and citizens before decisions are made and actions taken.

The Affected Environment

The Mt. Hood National Forest is in north central Oregon. It is bounded by the Columbia River on the north, by the Willamette National Forest and the Warm Springs Indian Reservation on the south and southeast. To the west, the Forest meets the Willamette Valley and on the east it joins the wheat fields and range lands of eastern Oregon. There are 1.1 million acres within the Forest boundaries. They lie primarily in Clackamas, Multnomah, Hood River, and Wasco Counties. These are the Counties most influenced by the management of the Forest. The Forest Supervisor's Office is in Gresham, Oregon, 15 miles east of Portland.

A full account of the Forest's environmental components is provided in Chapter III of the FEIS. Plans for uses of the Forest have been developed against a backdrop of its environment. This environment provides opportunities, and imposes limitations as well.

The Forest straddles the Cascade Mountain Range and includes the moist western slopes and the drier east side. The elevation of the Forest ranges from 65 feet above sea level on the Columbia River to the summit of Mount Hood, 11,235 feet high. A diverse environment results from the influences of climate and elevation. The Forest's most widespread resource component is its large volume of standing timber that grows on the productive forest lands. These stands contribute raw materials to the forest products industry and provide habitat required by wildlife species. The forested mountains are also an extremely important source of water for use by fish and wildlife, and for human consumption.

The Forest's natural environment provides a number of recreational attractions, including Mount Hood, the Columbia Gorge, numerous mountain lakes and streams, and a wide variety of plants and animals. These amenities combine with proximity to the Portland Metropolitan Area, to make the Forest a popular destination for outdoor recreation activities. Much of the Forest is highly developed with roads built primarily for logging. These roads, along with several major highways, provide access for recreational use of most of the

Forest. The Forest also includes six Wildernesses established by Congress. These, and other undeveloped areas, provide opportunities for people to experience solitude in a natural environment.

Public Issues

People look upon the resources of the Forest differently, depending upon their individual interests and needs. They would like to see the Forest managed in ways that satisfy these needs. While such wishes are understandable, they raise conflicting Public Issues that must be addressed in formulating the Forest Plan.

What are the relevant Public Issues? Obtaining the answers to that question led to an extensive and continuing process utilizing public meetings, newsletters, correspondence, and local news media reporting. It included personal contacts by Forest Service personnel. The process incorporated comments and suggestions from a wide cross-section of individuals and groups such as the Sierra Club, Northwest Forestry Association, Oregon Environmental Council, Mt. Hood Forest Study Group, and the Columbia River Inter-Tribal Fish Commission. Other contacts included adjacent landowners and National Forests, agencies of State and local governments, local employers, and Native Americans.

Early Phase

The Forest Planning process began in September of 1979. One of the first steps taken was that of trying to define, identify and focus attention on the important items to be considered as the Forest began the task of preparing a Forest Plan. Those items are now called public issues, management concerns, and resource use and development opportunities (ICOs).

A preliminary list of ICOs was included in informational brochures, distributed at public meetings and mailed to the public. The Mt. Hood National Forest held three informal meetings early in the process to help identify additional public issues, discuss management concerns and explore resource opportunities.

The dates and locations of our early public meetings were:

- November 17, 1979 at Mill City High School, Mill City, Oregon.
- November 28, 1979 at the Mt. Hood Supervisors Office, Gresham, Oregon.
- November 29, 1979 at the Hood River Inn, Hood River, Oregon.

Governmental agencies, local government officials, interest groups, Native American tribes, and individuals were consulted during this early development phase. Approximately 50 responses relating to the development of ICOs were received.

Revisions to ICOs - 1984

Over the intervening 4 years, the Forest Interdisciplinary Planning Team continued to review and make changes to the issues in order to keep them current. Through periodic meetings with groups, individuals, and agencies and as a result of changes in policy and procedures, some of the issues were modified. It is around this revised set of issues that the alternatives contained in the Draft EIS were designed and analyzed.

Revisions to ICOs Between Draft and Final

Analysis of the public comment confirmed that the public issues, management concerns, and resource opportunities identified in the DEIS are still valid. However, in response to public input, the list of public issues has been modified. Twelve individual issues, including two new issues, which focus on the supply of developed recreation and deer and elk management were identified. Other issues were modified or combined to reflect a shift in emphasis as a result of public comment. Appendix A describes the modifications in detail. Appendix J (Response to Public Comments) gives a detailed summary of the public comment, and describes how the Forest has attempted to respond to public input.

Over 5,000 pieces of mail incorporating approximately 80,000 comments were received concerning the DEIS. Most of the issues are related to some degree. Management activities that affect one resource will usually affect a number of other resources.

Map S-1 Mt. Hood National Forest Location Map

Issue 1: Level of Timber Supply on the Mt. Hood National Forest

There is a wide divergence of opinion concerning the production of timber from this Forest. The timber industry is an important part of the local and regional economic base, and the Forest has historically supplied significant amounts of timber. There is concern by many that current sell program levels cannot or will not be maintained. As a result, local communities will suffer economic hardship.

Other individuals believe that timber harvests should be decreased in order to maintain or enhance other resources. They are concerned about the negative impact of timber harvesting on fish habitat, older forest wildlife habitat, soils, water quality, unroaded recreation, and scenic quality.

Perhaps more than any other public issue, this one affects and is affected by the resolution of other resource issues. The most significant effect of other resource uses on timber is the classification of land as nonsuitable for timber management. Managing for fish habitat, older forest wildlife habitat, soil protection, water quality, wilderness, unroaded recreation, undeveloped areas, and natural research areas all reduce the number of acres available for intensive timber management.

Harvest rotation lengths, fertilization, thinning, and species mixture all are sub-components of this issue. Short rotations are generally more economically efficient than longer ones but can have adverse effects on other resources such as fish and wildlife habitat. Fertilization can improve yields per acre, but effects on fish habitat and watersheds may not be acceptable. Thinning of timber stands, which leads to optimum timber growth, may not be cost efficient. The species mixture has direct effects on other resources including wildlife habitats.

Other factors involved with this issue include the timing of fuel management projects, and the location, density and design of forest roads. Protecting soil productivity and assessing cumulative impacts to maintain land stability are also important considerations for this issue.

Issue 2: Community Stability

Forest management affects the jobs, incomes, and lifestyles of local residents in nearby communities through economic ties. Forest outputs have traditionally provided a base for the local forest products industry. Many communities are concerned about their timber harvest commodity receipts, and the payments made to their communities in lieu of taxes. In addition, the Forest provides resources that are important to local residents even though there is no direct economic tie. Local residents place a high value on amenities such as clean water, visual quality, and wildlife, and on personal uses such as firewood cutting and recreation.

The lifestyles of some residents and structure of certain communities are directly dependent on Forest outputs and expenditures. Small communities near the Forest, especially those on the east side of the Forest, are most affected. There is a concern that the Forest supply timber for local industries to sustain jobs and lifestyles.

On the other hand, intense timber harvest may conflict with other resources which influence other jobs, lifestyles and communities. This concern includes how changing recreational opportunities, wildlife and fish habitat, and visual quality will affect personal uses of the Forest as well as local tourist industries.

Issue 3: Maintenance and Distribution of Old Growth

Concern about the future of old growth stands on the Forest has risen sharply over the last few years. Old growth is now valued for its ecological diversity, recreation, scientific, wildlife habitat, and aesthetic qualities. Many believe that old growth forests are declining too rapidly, because they believe timber harvest rates exceed a sustainable level.

Others value old growth as a source of timber, contending that enough old growth has already been designated for preservation through "reserved" lands. There is also concern that potential volume production is lost due to slow growth or decay and mortality in old growth stands.

Protecting old growth would reduce the volume available for timber harvest, while the harvest of old growth reduces the amenity values associated with old growth.

It is estimated that there are approximately 345,300 acres of old growth currently existing on the Forest.

Issue 4: Viable Populations of Spotted Owls and Management Indicator Species

There is a concern that the Forest Service recognize declining or "diminishing" species and respond by providing high levels of habitat protection. Others are concerned that the cost of providing habitat, in terms of reduced timber harvest, and the subsequent effects on economic stability in nearby communities, may be unacceptable.

The northern spotted owl is a mature forest and old growth habitat associated species that lies at the center of this controversy. The spotted owl was, in July 1990, listed as Threatened Species by the U.S. Fish and Wildlife Service. The opinions of groups and individuals vary on what quantity of habitat should be maintained to insure the continued survival of the spotted owl.

The issue of maintaining viable populations of spotted owls and other management indicator species affects a number of other resources and issues, but is most heavily intertwined with timber production and harvest, roading, and recreation. Depending on the manner, location, and intensity of harvest, logging can have a detrimental effect on wildlife habitat. Harvesting of old growth timber may threaten the species of animals and plants dependent on it. Increased roading may increase harassment of wildlife and may reduce their ability to make use of available habitat.

While wildlife are an attraction and benefit to recreational use of the Forest, too much recreational use can be detrimental. Some species of wildlife are very tolerant of human presence, some are very intolerant and a small amount of human activity will cause them to leave the area. Water pollution and harassment of animals can occur. These harmful effects are more apt to happen in heavily used or developed areas.

Issue 5: Conflicts Between Management Activities and Competing Recreational Activities

Conflicts arise between recreational uses and other management activities, as well as between different types of recreation uses. Management activities which disturb the natural features can conflict with many recreational uses. For example, timber management and associated road building activities may preclude the provision of primitive unroaded recreational experiences.

The potential for conflict also exists between different type of recreational uses. Primative recreational experiences such as backcountry hiking may be incompatible with use of off-road vehicles. Where solitude is needed to fulfill recreational needs, large numbers of people or the use of machines by others can cause conflicts.

There is a concern that much more of the Forest land base needs to be placed in allocations which provide for or do not conflict with recreational activities. Others are concerned that the cost of providing recreational experiences, in terms of reduced timber harvest, and the subsequent effects on the economic stability of nearby communities, may be unacceptable.

This issue is closely tied to the issue of visual quality. Many of the recreational visitors to the Forest have expressed considerable concern for its visual appearance. The high recreational values of the forest are directly linked to its beautiful scenery. However, providing a pleasing appearance may be in conflict with the management of other resources. In addition, providing primative recreational experiences may also benefit various species of wildlife.

Issue 6: Maintenance and Enhancement of Scenic Quality

Landscapes seen from areas that are heavily used by the public, such as roads, rivers, or developed recreation sites, are called scenic viewsheds. Viewsheds are more sensitive than other areas because the scenic quality may significantly affect the recreational experience of those viewing it.

As timber harvest and road construction activities enter new areas, changes in the scenic resource become more apparent. The scenic quality issue revolves around the degree of protection scenic values should be given and the cost and impacts of visual resource management on other Forest activities. In particular, reductions in timber harvests and associated costs of implementing visual management activities are of concern.

Many people find changes to the natural setting objectionable and feel that most or all of the viewsheds should be maintained in a natural character. From a different perspective, some people feel that reducing timber harvests on major portions of the Forest is not justified by the resulting harvest volume reduction.

Protecting visual quality requires careful management of timber activities, including rotation lengths, harvest unit design, harvest methods, and species mix. This may reduce timber outputs and increase costs. However, since this lessens the intensity of ground-disturbing activities, it may benefit fish, wildlife, and recreation.

Issue 7: Disposition of the Remaining Roadless Areas

Public comment on the DEIS indicates strong disagreement about the future management of the remaining 118,000 acres of unroaded areas. Timber interests feel that removing more land from the timber base for undeveloped recreation is unnecessary and unjustified. Others feel that unroaded opportunities are dwindling and these areas should remain roadless, thus providing protection for watersheds, habitats for wildlife and opportunities for backcountry recreational experiences.

There are many resource interactions involved. Developing some roadless areas could increase timber harvests, as well as opportunities for development of other resources. Retaining some roadless areas in an undeveloped condition provides; diversity of Forest ecosystems, habitat for sensitive plant and wildlife species, water quality, opportunities for semiprimitive recreation, old growth, and retains options for future land use decisions.

Issue 8: Diminishing Supply or Availability of Resources Traditionally Used in Native American Religious and Cultural Life

Native Americans (e.g. Confederated Tribes of the Warm Springs) who reside in the Mt. Hood area have a vital interest in how the Forest is managed. Native Americans have traditionally used lands that are now within the Mt. Hood National Forest for hunting, fishing, gathering plant resources, and religious ceremonies. These tribal groups have raised the issue of decreases in availability of the forest products that they have traditionally used in religious and cultural practices. These products range from anadromous fish and wildlife, such as salmon and elk, to a variety of plant resources, such as huckleberries, cedar and alder.

These groups have expressed a concern that years of land management to promote timber may have reduced the supply and accessibility of the resources they value.

The continued use of traditional resources by Native Americans has been recognized in the development of this plan. Native American rights will continue to be a part of on going Forest management. See Forestwide Human Rights Standards (Forest Plan, Chapter 4).

Issue 9: Maintenance and Rehabilitation of Fish Habitat and Water Quality

The demands for maintenance and rehabilitation of fish habitat and water quality have steadily increased in the last decade.

The productive capability of fish habitat and the quality of water are closely linked. Both are heavily influenced by the overall condition of the watershed and are specifically affected by conditions in riparian areas.

Due to the wide distribution of riparian and aquatic habitats across the Forest, the management of fish and water resources frequently involves interactions with a variety of other resources. Activities or resource programs which do not significantly disturb the ground, such as wilderness management, visual and wildlife management, are compatible or complementary with fish and water management. Activities which can and sometimes do affect the riparian zone, such as timber management activities, road construction, range management, energy development, and irrigation are to varying degrees competitive. These activities can reduce the capability of the habitat to produce fish as well as reduce water quality.

Preservation of water quality is an important issue to many residents near the Forest, as well as many of those who use the Forest for recreation or irrigation. A very large number of people depend on water flowing from the Forest's watersheds.

Many groups and individuals believe that the maintenance of anadromous fish habitat and the restoration of damaged fish habitat should be top priorities of the Forest Service.

Issue 10: The Supply of Developed Recreation Site Opportunities

The Mt. Hood National Forest can be considered an urban forest and is one of eleven forests initially identified by the Forest Service as meeting the urban forest characteristics of being located within 50 miles of populations greater than 1 million people and demonstrating unique management challenges. It serves as the "backyard" for many residents of the Portland metropolitan area and the Willamette Valley. According to the Oregon State Department of Parks and Recreation, the Forest is nearly the sole provider of specific types of recreational opportunities, and the major provider of many others.

This issue was raised in individual responses to the Draft Forest Plan. They expressed concern that the Forest is not increasing the number of developed sites at a rate which will accommodate a growing tourism trade.

Many groups feel that the construction and reconstruction of additional campground facilities should be high on the Mt. Hood's list of priorities. Facilities and vegetation in some developed sites, such as highly used campgrounds, are deteriorating. Some sites have been closed and many facilities are in poor condition.

Issue 11: Wild, Scenic, and Recreational Rivers

Some people believe that all of the rivers and many streams on the Forest should be included in a preliminary administrative recommendation to Congress for consideration under the Wild and Scenic Rivers Act. Other people are strongly opposed to the recommendation of some or all rivers and stream segments.

The 1988 Oregon Omnibus Wild and Scenic Rivers Act designated five rivers on the Mt. Hood National Forest. These rivers are the Clackamas River, White River, Roaring River, Salmon River, and Sandy River.

The public comment by the Governor's Task Force, Oregon Rivers Council, Sierra Club, and other individuals expressed concern regarding the process used to recommend rivers for designation. In response, the Forest decided to conduct an Eligibility study on 12 additional rivers. These rivers were specifically identified in the public comment process.

The eligibility process and evaluation criteria that was used for river selection was endorsed by the Oregon Department of Parks and Recreation and Oregon Rivers Council. Of the 12 rivers which were studied, all or parts of 11 rivers were found to be eligible.

Suitability studies will begin when the Forest Plan is complete.

A portion of the East Fork of the Hood River is located within the Mt. Hood Meadows ski area permit boundary. The Mt. Hood Meadows master planning effort had potential project implementation needs which required the completion of the Suitability Study for that river. For this reason, the Forest completed its study of the East Fork Hood River as part of the Forest Planning process. It was found not suitable.

Issue 12: Deer and Elk Management

The Department of Fish and Wildlife, environmental organizations, tribal groups, and private citizens feel that the preferred alternative did not adequately provide for the management of deer and elk species in timber emphasis areas. They believe that herd management objectives, cover forage ratios, forestwide road densities, and dispersion of harvest units were not adequately analyzed. The removal of land from timber emphasis to meet the needs of deer and elk will cause a reduction in the Forest's harvest level.

Alternatives Including the Proposed Action

Eight alternatives were developed in detail. The alternatives, including the proposed action (the Preferred Alternative) are based on the identified issues, concerns, and opportunities. Each alternative is designed to achieve specific goals and objectives. Each is a unique combination of land uses, forest management activities, and schedules designed to address, mitigate, or resolve the planning issues.

Table S-1 Management Area Acres by Alternative

Management Areas	Alternative							
	NC	A	C	E	F	H	I	Q (Preferred)
A-2[1] Wilderness	186,200	186,200	186,200	186,200	186,200	186,200	185,050	186,200
A-3 Research Natural Areas	1,150	1,150	1,150	1,150	1,150	1,150	1,150	1,150
A-4 Special Interest Areas	29,550	29,550	25	36,500	40,550	30,300	31,550	38,800
A-5 Unroaded Recreation	850	0	0	7,100	48,000	15,850	52,250	16,550
A-6 Semi-Primitive Roaded Recreation	0	0	0	2,600	7,850	0	2,000	5,000
A-7 Old Growth	0	0	0	0	2,000	263,200	10,700	2,000
A-8 Spotted Owl	0	52,650	52,650	52,650	52,650	86,750	86,750	66,050
A-9 Key Site Riparian	0	10,400	11,550	14,500	14,700	14,700	14,000	14,700
A-10 Developed Recreation	650	650	1,700	650	1,700	1,700	1,700	1,700
A-11 Winter Recreation	7,250	7,250	7,600	7,600	9,400	8,950	5,600	11,700
A-12 Outdoor Education	100	100	100	100	100	100	100	100
A-13 Bald Eagle	700	0	0	0	50	700	700	700
Subtotal A	226,450	287,950	260,975	309,050	364,350	609,600	401,750	344,650
B-1 Wild, Scenic, & Rec. Rivers	33,550	18,350	18,100	17,100	15,950	7,750	13,950	13,650
B-2 Scenic Viewshed	160,700	108,100	0	92,650	184,900	69,350	8,600	113,650
B-3 Roaded Recreation	0	0	0	1,550	17,200	0	0	9,650
B-4 Pine Oak Habitat	0	0	0	10,050	15,700	10,850	21,300	11,550
B-5 Pileated Woodpecker/Pine Marten Habitat	0	49,850	51,050	47,450	43,300	19,300	39,400	44,950
B-6 Special Emphasis Watershed	0	0	0	30,200	46,150	30,100	37,800	78,600
B-7 General Riparian	0	103,850	107,150	96,200	87,950	50,700	83,750	91,550
B-8 Earthflow	0	0	0	17,800	0	11,600	16,650	25,600
B-9 Wildlife Visual	0	0	0	3,900	0	0	52,700	3,750
B-10 Winter Range	0	0	0	0	3,900	7,450	71,450	8,700
B-11 Summer Range	0	0	0	0	2,250	5,000	191,225	5,150
B-12 Backcountry Lakes	0	0	0	0	3,900	0	0	3,900
Subtotal B	194,250	279,950	176,300	316,900	421,200	212,100	536,825	410,900
C-1 Timber Emphasis Subtotal C	517,875	370,675	501,300	312,625	153,025	116,875	0	183,025
DA1 Bull Run Drainage	59,925	39,600	0	39,800	39,225	38,425	38,425	38,025
DA2 North Buffer	1,450	1,450	1,450	1,450	1,450	1,450	1,450	1,450
DA3 Research Natural Areas	6,500	4,400	4,400	4,400	4,400	4,400	4,400	4,400
DA8 Spotted Owl	0	11,900	11,900	11,900	11,900	12,950	12,950	13,300
DA9 Key Site Riparian	0	1,050	800	1,350	1,350	1,100	1,100	1,050
DA13 Bald Eagle	75	0	0	0	75	75	75	75
DB2 Scenic Viewshed	1,500	950	0	0	950	950	950	950
DB5 Pileated Woodpecker/Pine Marten Habitat	0	6,850	6,850	6,850	6,850	6,850	6,850	6,850
DB7 General Riparian	0	10,800	10,800	10,800	10,800	10,800	10,800	10,800
DB8 Earthflow	300	50	0	0	50	50	50	50
DC1 Timber Emphasis	21,250	13,950	54,800	14,450	13,950	13,950	13,950	14,050
Subtotal D[2]	91,000	91,000	91,000	91,000	91,000	91,000	91,000	91,000
EA1 Scenic Area	31,050	16,400	16,400	16,400	16,300	15,100	15,100	15,500
EA4 Special Interest	75	75	75	75	75	75	75	75
EA8 Spotted Owl	0	9,800	9,800	9,800	9,800	12,550	12,550	10,550
EA9 Key Site Riparian	0	250	250	250	250	200	200	250
EA12 Outdoor Education	300	300	300	300	300	300	300	300
EA13 Bald Eagle	150	0	0	0	100	150	150	150
EB2 Scenic Viewshed	2,300	1,300	1,300	1,300	1,300	1,300	1,300	1,300
EB5 Pileated Woodpecker/Pine Marten	0	2,050	2,050	2,050	2,050	900	900	2,050
EB7 General Riparian	0	3,700	3,700	3,700	3,700	3,300	3,300	3,700
Subtotal E	33,875	33,875	33,875	33,875	33,875	33,875	33,875	33,875
Total	1,063,450	1,063,450	1,063,450	1,063,450	1,063,450	1,063,450	1,063,450	1,063,450

[1] *An additional 700 acres of non-federal land occurs within the boundaries of existing Wilderness.*

All alternatives except NC propose three research natural areas within Wilderness boundaries. The acreage for those RNAs is reflected in allocations A3 and DA3.

[2] *An additional 4,400 acres of non-federal land occurs in the Bull Run.*

Formulation of Alternatives

The following steps were followed to develop alternatives:

Step One involved identifying Issues, Concerns, and Opportunities (ICOs). The ICOs were used to determine what resource information and other data were needed to solve them.

Step Two involved the collection of resource information and the development of resource maps.

Step Three combined resource information such as soils, slope, vegetation, etc. onto a single overlay and like characteristics were aggregated into groups called Analysis Areas. Analysis Areas are tracts of land assumed to be homogeneous in terms of outputs and effects.

Step Four developed management direction that could be applied to the ground in various combinations to resolve the ICOs. This management direction is in two broad forms: Forestwide Standards and Guidelines; and Management Area Category Standards and Guidelines and Prescriptions.

Step Five involved the actual formulation of alternatives. An alternative is one approach to managing the land and resources of the Forest. Each alternative employs a different array of management areas to achieve its goal. By assigning different mixes of management areas to various portions of the Forest, a unique combination of resource outputs and environmental conditions is produced.

Step Six entered alternative designs into the Forest planning model (FORPLAN). FORPLAN is a linear programming computer model. Given the assignment of strategies to the land, the FORPLAN model selected the best set of Management Prescriptions to meet the overall alternative goals and objectives.

Each alternative presents a combination of management areas where sets of management practices occur. Some management areas emphasize protection of wildlife habitat and naturally-occurring ecosystems, while other emphasize sustained timber yields or various types of recreation opportunities. Each alternative distributes Forest lands to management areas in different ways. These are listed by acreage in Table S-1.

The Preferred Alternative is that alternative which is selected from all those formulated as the one which best maximizes the net public benefits. The actual selection of the Preferred Alternative is done by the Regional Forester.

The dropping of Alternatives B, D and G was the major change made between draft and final EIS. After looking at the range of outputs of all the alternatives, it appeared that these alternatives were similar enough to other alternatives that they did not need to be analyzed in detail. In addition, there was little public comment received on some and the issues addressed by them were felt to be adequately addressed by the other alternatives. Based on public comment, a new preferred alternative was developed.

The following narrative and subsequent Table S-2 Indicators of Responsiveness, summarize these differences between alternatives.

Management Area Category Definitions

Category A

Management activities in Category A management areas are designed to meet specific resource objectives other than timber production and often are designed to result in near natural conditions over time.

These areas generally have no regulated timber harvest. Timber salvage operations may be permitted under certain conditions or restrictions. However, the total amount of salvage volume from areas A2 thru A12 is not expected to exceed 1 MMBF/year under any of the alternatives considered in detail.

Category B

Management objectives in Category B management areas are designed to achieve specific resource objectives while achieving an objective of promoting a healthy, growing forest through management for timber. These management areas have additional restrictions regarding rate of harvest, sizes of openings, and minimum rotations.

Category C

Management activities in area C1 are designed primarily to provide wood products needed to meet national demand, and to support local communities dependent on timber for employment, while achieving the objective of promoting a healthy, growing forest mosaic through timber harvest. These objectives are achieved while concurrently being sensitive to, and managing for, the other forest resource uses and values including transitory forage production and public recreation use.

Category D

This category is used for lands within the Bull Run Watershed Planning Unit.

Category E

This category is used for lands within the boundaries of both the Columbia River Gorge National Scenic Area and the Mt. Hood National Forest.

The No Change Alternative - NC

This alternative responds to the Regional direction to project the most likely condition of the Forest in the future if current management practices and policies are not changed, and analytical techniques and legal requirements remained as they were when the existing Timber Management Plan was adopted in 1978. As such, this alternative predates the National Forest Management Act regulations, 36 CFR Part 219, of 1979.

The outputs and effects displayed for Alternative NC are based on a FORPLAN run that incorporates the allocations and management direction contained in the 1978 TM Plan and Unit Plans. Although this alternative is based on allocations and management direction contained in existing unit plans and the 1978 Timber Management Plan, it uses updated resource information to make estimates of the outputs and effects. This allows a better comparison of Alternative NC to the other alternatives. The updates most apparent are in the new tentatively suitable timber land base and timber yield tables derived from a recent timber inventory.

The No Action Alternative - A

This is the "No-Action" Alternative, which is required by the National Environmental Policy Act (NEPA) and the National Forest Management Act (NFMA). With differences indicated below, it projects today's Forest management into the future. This provides a basis for comparison when evaluating the range of alternatives.

Alternative A is based upon and is essentially the same as the No Change Alternative. The major difference is that this Alternative fully incorporates all NFMA requirements, including the Management Requirements (MRs).

Alternative A is designed to present estimates of the outputs and effects of managing the Forest under current plans and practices, adjusted as required by new laws and regulations, including meeting the MRs for wildlife species and soil and water resources, and incorporating new timber suitability criteria. Alternative A would permit a variety of existing uses to continue, including present timber management practices. This alternative projects results of managing in the future without regard to public issues or management concerns that have arisen since existing plans were approved, aside from the MRs. The cost of alternative A is within existing budget requests.

Alternative C

This alternative was developed in response to the public issues concerning adequate timber supplies and community stability. It would provide maximum timber harvest consistent with resource protection provided by management requirements. Alternative C most closely approximates the Forest and Rangeland Renewable Resources Planning Act of 1974 (RPA) program for the Mt. Hood National Forest. Under Alternative C all land suitable for growing trees would be managed for intensive timber production. Timber harvesting would be on a regularly scheduled basis in the Bull Run Watershed.

A major feature of this alternative is the large amount of acres allocated to timber emphasis and a corresponding decrease in the unroaded and scenic viewshed allocations.

Alternative E

This was the Forest's preferred alternative in the draft EIS. It was developed to reflect present land uses while meeting management requirements. It is based on an assumption that past determinations of management emphasis in previous plans are still generally valid and effective when also reflecting the most recent laws and scientific information. This alternative reflects more recently identified needs to reduce timber harvest levels on some portions of the Forest in response to the public issues of water quality, fish and wildlife, and recreation. It also emphasizes the values of particular scenic corridors. Recreation of all kinds would be available and its quality would meet public demands. Timber would be managed intensively where such intensive management has been planned in the past, including seven of the presently unroaded areas. Timber harvest would often be used to help achieve other Forest objectives. In response to the community stability public issue, the timber harvest schedule would be a departure which emphasizes production of volume above this alternative's long-term sustained yield quantity.

Alternative F

This alternative was developed as a particular response to the recreation public issue, especially the visual quality aspects of the issue. It is designed to meet the needs of visitors to the Forest for outdoor recreation in natural settings. Its main objective is to provide scenic landscapes that are visible from the Forest's travel routes and recreation areas. Under this alternative, the emphasis of management would be on providing a wide range of roaded and unroaded recreational settings and opportunities. Natural appearing conditions would be perpetuated by periodic removal of small volumes of timber in areas that are visible. Higher levels of timber harvest would take place in areas of the Forest that are seldom seen. Benefits to wildlife and fish habitat would occur because of management of the land for scenic quality.

Alternative H

Alternative H is developed to supply recreational opportunities in primitive or natural settings, away from roads and other major evidence of human activity. It precludes future development in all presently unroaded areas and in places on the Forest adjacent to Wildernesses and unroaded areas that also offer primitive and semi-primitive nonmotorized recreation opportunities. Alternative H would also preserve the most existing old growth timber stands. Retaining old growth would provide complementary benefits for fish and wildlife habitats, and maintain or improve scenic quality. Timber would be harvested in areas where it has been removed in the past, and where it would not conflict with the needs of dispersed recreational activities.

Alternative I

Alternative I is developed primarily to provide for wildlife and fish habitat needs. In all areas considered important for fish and wildlife habitat, stocking objectives would be achieved by precluding timber harvest, extending rotations or otherwise modifying timber management practices. The needs of animal species which require open areas would be met by continued timber harvest elsewhere on the Forest. All unroaded areas would be kept free of roads to provide the security for wildlife as well as opportunities for recreation in an unroaded setting and for future wilderness designation. The retention of natural appearing landscapes throughout the Forest would be emphasized.

Alternative Q

This is the Forest Service preferred alternative. It is a new alternative and was not displayed in the draft EIS. Beginning with the draft EIS preferred alternative (E), alternative Q was developed to respond to public comment and new information. This alternative reflects more recently identified needs to reduce timber harvest levels on some portions of the Forest in response to the public issues of water quality, fish and wildlife. It also emphasizes the values of particular scenic corridors. Recreation of all kinds would be available and its quality would meet public demands. Timber harvest would often be used to help achieve other Forest objectives.

Summary of Results Related to the Planning Issues

The following table summarizes the outputs of the alternatives as they relate to the planning issues. Items shown are the indicators of responsiveness associated with each issue.

Key Changes Between Draft and Final EIS

- Costs were reviewed and updated.
- New Timber Inventory incorporated and new yield tables developed.
- Timber Suitability was remapped.
- Updated recreation growth projections from State of Oregon were utilized.
- Spotted owl direction contained in Regional Guide is incorporated into FEIS.
- Big game management standards have been clarified.
- Pine Oak Management area goals and standards were clarified.,
- Threatened and endangered species management direction was made site specific.
- Roadless Area acreage was updated.
- Several Back Country Lakes to be protected.
- Visual Quality Acres to be protected have increased.
- Special Emphasis Watersheds to be protected increased.
- Acres allocated to timber emphasis decreased.
- Acres in Earth Flow Management Plan updated.

Table S-2 Indicators of Responsiveness of Alternatives to Major Issues

Indicators of Responsiveness		NC (No Change)	A (No Action)	C (RPA)	E (Draft Pre-ferred)	F	H	I	Q (Preferred)
		Alternative							
Timber									
Ave. Annual Vol. Offered First Decade:									
Allowable Sale Quantity Million Cubic Feet/Year		51.6	38.9	46.4	53.4	25.5	18.0	27.5	31.9
(million board feet)/Year		(313)	(235)	(282)	(317)	(154)	(108)	(165)	(189)
Timber Sale Program Quantity Million Cubic Feet/Year		58.8	44.3	52.9	60.9	29.1	20.5	31.3	36.4
(million board feet)/Year		(357)	(268)	(320)	(361)	(176)	(123)	(188)	(215)
Long term Sustained Yield Cap.									
Million cubic feet/Year		51.6	38.9	46.4	37.5	25.8	18.0	27.5	31.9
Communities									
Ave. Annual Payments to Counties (Millions $)		12.0	8.9	11.0	11.8	5.8	4.0	6.1	6.8
Old Growth									
Acres of Existing Old Growth-Remaining After 50 yrs. (1000s)		186	225	205	224	262	290	272	255
Potential Old Growth Including Ingrowth After 50 Years		401	444	422	430	493	523	500	475
Management Indicator Species									
Spotted Owl # of Pairs 1st Decade		166	171	167	167	173	175	173	173
Deer/Elk # 1st Decade (1000s)		D-17.4 E-4.9	D-18.3 E-5.1	D-17.4 E-4.9	D-24.1 E-6.5	D-24.9 E-6.7	D-28.2 E-7.3	D-27.4 E-7.1	D-28.2 E-7.4
Recreation Activities									
Dispersed (MM RVD's)									
Primitive	Demand	.899	.899	.899	.899	.899	.899	.899	.899
	Supply	.144	.144	.144	.144	.144	.144	.151	.144
Semi-primitive	Demand	1.349	1.349	1.349	1.349	1.349	1.349	1.349	1.349
Non-motorized	Supply	.108	.172	.138	.217	.312	.227	.333	.248
Semi-primitive	Demand	.674	.674	.674	.674	.674	.674	.674	.674
Motorized	Supply	.038	.028	.005	.020	.035	.021	.091	.027
Roaded Natural	Demand	4.946	4.946	4.946	4.946	4.946	4.946	4.946	4.946
	Supply	2.165	3.274	2.119	3.841	5.055	6.658	7.450	5.037
Road Modified	Demand	3.372	3.372	3.372	3.372	3.372	3.372	3.372	3.372
	Supply	6.327	4.816	6.376	4.007	2.035	1.481	0.251	2.381

Table S-2 Indicators of Responsiveness of Alternatives to Major Issues (continued)

Indicators of Responsiveness		Alternative							
		NC (No Change)	A (No Action)	C (RPA)	E (Draft Preferred)	F	H	I	Q (Preferred)
Rural	Demand	11.016	11.016	11.016	11.016	11.016	11.016	11.016	11.016
	Supply	.916	.916	.923	.931	.793	1.075	0.806	0.909
Scenic Quality									
Expected Visual Condition After 50 years									
Viewsheds Appearing Natural		6	7	1	8	15	21	10	12
Viewsheds Appearing Slightly Altered		6	5	1	13	25	21	17	22
Roadless Areas									
Acres Remaining Unroaded (50 Yrs) (1000s)		57	57	34	68	109	111	114	81
Areas Remaining Unroaded (50 yrs)		3	3	2	3	9	9	10	6
Fish Habitat/Water Quality									
Acres Managed to Meet Riparian-Objectives (1000s)		309	474	374	517	577	769	605	591
Acquatic Habitat Stability Index (1st Decade)		4.0	6.0	4.4	5.9	7.1	7.9	7.4	6.7
Supply of Developed Recreation Oppotunities									
Million RVD's		3	3	3	3	3	3	3	3
Wild/Scenic/Recreation Rivers									
No. of Rivers Studied for Eligibility		12	12	12	12	12	12	12	12
Deer & Elk Management		See Management Indicator Species Above							

- Five Rivers have been designated as Wild/Scenic/or Recreational Rivers.
- The Northern Spotted Owl was listed as "Threatened" in July 1990 by U.S. Fish and Wildlife Service.
- A new preferred alternative was developed.
- Portions of eleven rivers were found eligible for Wild, Scenic and Recreational River status.

Detailed Description of the Preferred Alternative

Highlights from the Preferred Alternative are as follows:

Timber Supply

Produce as much timber as possible on C1 lands. Generally, use intensive practices such as planting and thinning where economically efficient to do so. Produce timber in accordance with other resource objectives on B lands. Offer an allowable sale quantity of 189 mmbf/year.

Old Growth

Some old growth in special interest areas, roadless areas, and other small areas would be set aside from regulated harvest.

Scenic Quality

Assure that at least 34 of the Forest's 46 most sensitive viewsheds do not appear more than slightly altered in 50 years.

Wildlife

Deer and Elk

Under this alternative, standards and guidelines for deer and elk winter range would be incorporated, as well as additional management protection provided through land allocations B10 and B11. This alternative would produce a stable and continual population of deer and elk across the Forest. A moderate per square mile deer and elk density would be managed for. Some critical summer and winter range would be identified for intensive management.

Merriam's Turkey and Silver-Gray Squirrel

Under this alternative, standards and guidelines for Merriam's turkey and silver gray squirrel will be incorporated (land allocation B4). This alternative would manage for suitable nesting and roosting habitat across the pine/oak habitat found on the eastern portion of the Forest. This alternative would produce a stable and continual population of turkey and squirrel on the Forest.

Other Management Indicator Species

Under this alternative, the Regional Management Requirements (MR) for pileated woodpecker and pine marten would be met. Management will consist of 96 MR areas for pileated woodpecker and 231 MR areas for pine marten (land allocation B5). Each of the MR areas for pileated woodpecker will consist of at least 600 acres of suitable habitat with a 300 acre contiguous core of old growth or mature timber. Pine marten MR areas will consist of at least 320 acres of suitable habitat with a 160 acre core of contiguous old growth or mature timber. The numbers of MR areas managed will remain constant throughout decade 5. Additional protection of suitable habitat will be provided through land allocations for Wilderness areas and SOHA's.

Threatened and Endangered Species

This alternative would meet the management requirements for bald eagles, peregrine falcons and spotted owls.

Bald eagle habitat areas would be provided under this alternative (land allocation A13).

Under this alternative spotted owl management as defined in the preferred alternative of the Final Supplemental Environmental Impact Statement to the Pacific Northwest Regional Guide would be implemented. Sixty-six management areas would be maintained, each containing 1,500 acres of suitable spotted owl habitat.

Fish Habitat and Water Quality

This alternative would provide for substantial, long-term increases in Forestwide riparian resource (fish habitat and water quality) capabilities.

This alternative would provide for substantial, long-term increases in Forestwide riparian resource (fish habitat and water quality) capabilities.

This alternative would also implement substantial increases in land allocations to riparian and watershed land allocations.

This alternative is responsive to concerns about riparian areas and watersheds. Portions of eighteen watersheds totaling approximately 78,600 acres would be designated as special emphasis watersheds. An additional 33,400 acres within the eighteen watersheds will be afforded equal or greater protection within other allocations including A2-Wilderness, B2-Scenic Viewshed, and B8-Earthflow designations, etc. About 16,650 acres would be allocated to key site riparian management areas.

Recreation

A "standard" level of service is to be provided. This is intended to meet the demands of the public in a manner which is responsive to changing desires over time relative to the quality of recreational services and facilities provided. Maintain the ability to supply at least the following Recreation Visitor Days (RVDs) through the year 2030.

- Primitive (144,000)
- Semi-primitive Motorized (248,000)
- Semi-primitive Nonmotorized (27,000)
- Roaded Natural (5,037,000)
- Roaded Modified (2,381,000)
- Rural (909,000)

Roadless Areas

Harvest timber in all of the Badger Creek and parts of the Salmon-Huckleberry, Bull of the Woods, and Mt. Hood additions. The majority of Twin Lakes, Wind Creek, Eagle, Lake, Roaring River, Larch Mtn., and Olallie will remain unroaded.

Communities

This alternative responds somewhat to those communities that are highly dependent on wood products industry jobs. It would provide a level of timber harvest which could support many jobs, but which would be lower than recent levels. Payments to counties would be moderately high.

This alternative would respond fairly well to the needs of those communities where recreation is an important part of the economy. It would provide a high level of recreation, and also protect some of the highest quality recreation opportunities on the Forest, thereby helping the growth of the recreation industry.

Wild and Scenic Rivers

The following rivers were all found eligible for consideration as Wild and Scenic Rivers under the Wild and Scenic Rivers Act. Interim protection of the river corridor and area viewed from the river and major travelways along the river would continue until it is determined that the river is not suitable for inclusion into the national system, or for rivers found suitable for at least 3 years subsequent to submittal of recommndations to Congress..

- Middle Fork of the Hood River
- A portion of the Zigzag River
- Eagle Creek in Clackamas County
- North Fork of the Clackamas River
- A portion of the South Fork of the Clackamas River
- Fish Creek
- South Fork of the Roaring River
- A portion of the Oak Grove Fork of the Clackamas River
- Collawash River
- North Fork of the North Fork of the Breitenbush River

The East Fork of the Hood River was found eligible but would not be recommended for designation under the Wild and Scenic Rivers Act. In the corridor of segment two, Stringer Meadows Special Interest Area would be designated around the wet meadow complex which was the identified outstandingly remarkable value for the river segment. The purpose of the Special Interest Area would be to protect and interpret important meadow values. The remainder of the segment would be in management area A11 and would be open to a range of ski area management activities.

Suitability studies on the remaining eligible rivers should be completed within 5 years from the release of this plan.

Alternatives' Response to Public Issues

Alternative management plans were designed to address the Public Issues in different ways. Alternatives can best be compared to each other by identifying how well each alternative responds to all of the Public Issues. The "Indicators of Responsiveness" to the Public Issues, are described in Table S-2.

The following figures highlight the differences between alternatives for selected issue areas.

Timber

Figure S-2 Long Term Sustained Yield Capacity

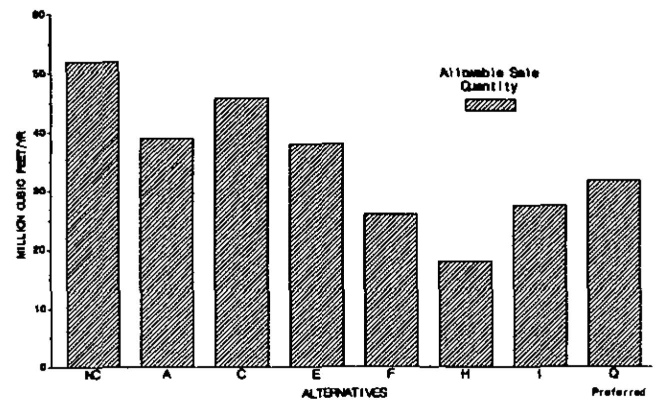
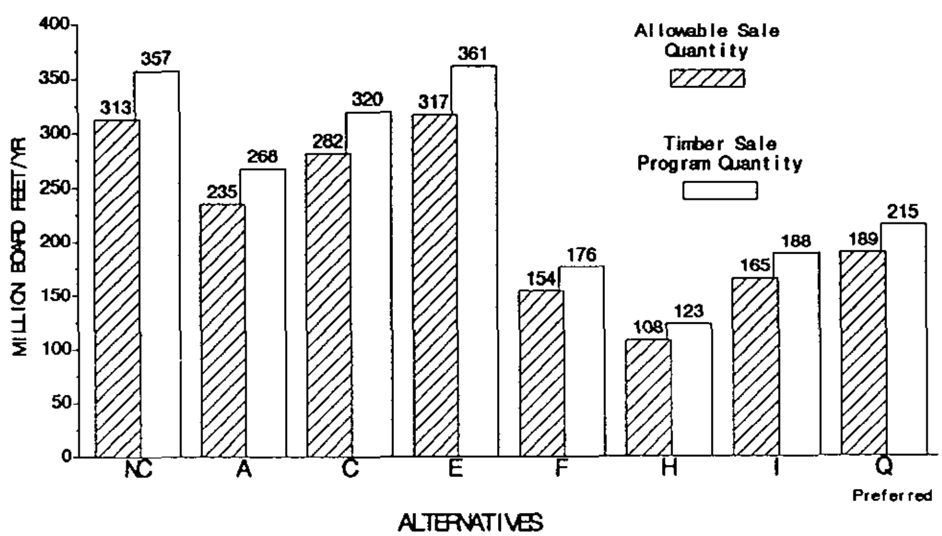
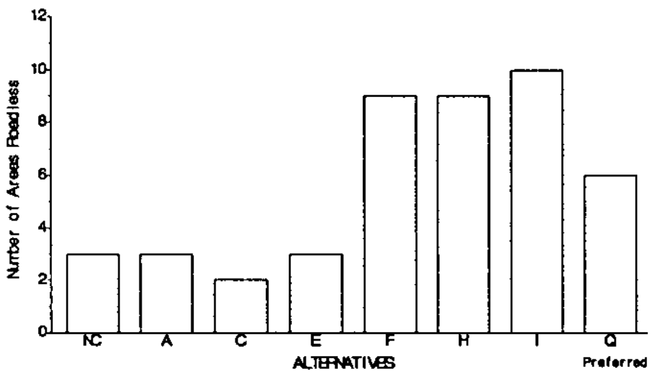


Figure S-1 Average Annual Timber Volume Offered, First Decade



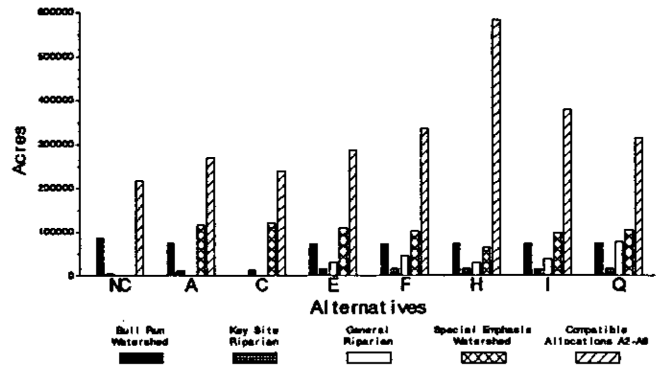
Roadless Areas

Figure S-3 Areas Retaining Unroaded Characteristics at Least 50 Years



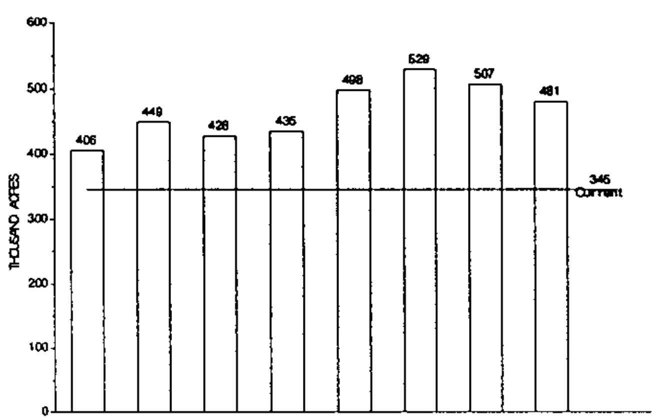
Riparian Management

Figure S-5 Acres Allocated to Riparian Management



Old Growth

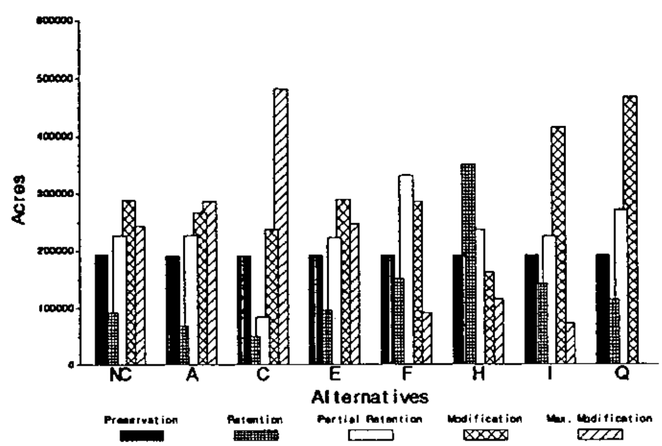
Figure S-4 Old Growth Remaining After 50 Years*



*Old Growth stands 170 years+ and older including ingrowth

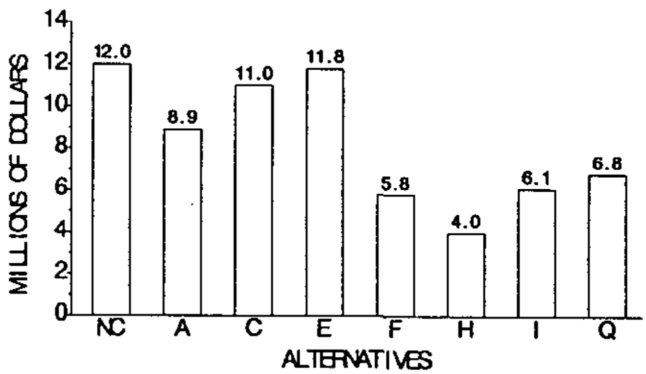
Visual Quality

Figure S-6 Acres in Each Visual Quality Objective



Community Stability

Figure S-7 Payments to Counties 1st Decade - Average Annual



Environmental Consequences of the Alternatives

Chapter IV of this FEIS addresses the potential environmental consequences of implementing each alternative on the various environmental components. The discussion focuses on direct, indirect, and cumulative effects.

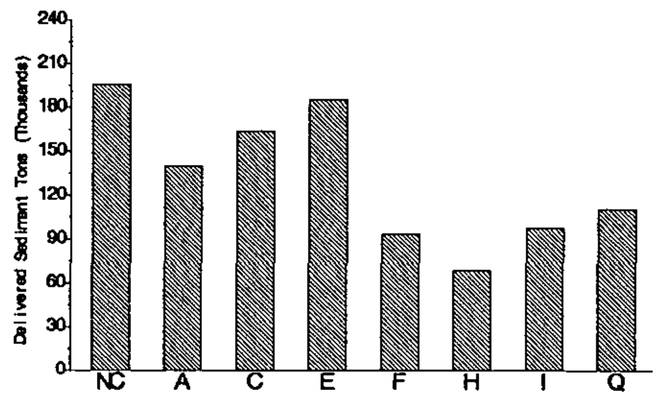
All effects disclosed in this chapter assume complete compliance with the Standards and Guidelines summarized in the Forest Plan, Chapter 4 and Appendix H of the FEIS. Environmental consequences would be far more severe, or unacceptable, in the absence of Standards and Guidelines and accompanying Best Management Practices (BMPs). These Standards and Guidelines contain many of the mitigation measures that avoid, minimize, reduce, or eliminate probable or potential environmental impacts.

Selected items are presented here:

Soil/Sedimentation

Timber harvesting and road construction increase the potential for soil erosion and the resulting sedimentation of forest streams. Alternatives with larger amounts of timber harvest will have greater potential to increase erosion and sedimentation. (See timber discussion for comparison of timber harvest levels.)

Figure S-8 Index of Delivered Sediment, 1st Decade



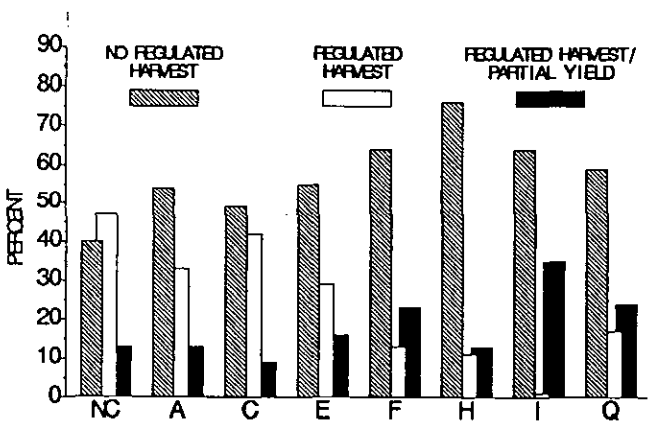
Vegetation

Quantitative changes in age classes, seral stage, and general character of vegetation on timber-suited land will vary by alternative. Alternatives vary by the way land is allocated to various Management Areas. The management areas can be grouped as timber emphasis, reduced timber yield, or no regulated harvest. Human-caused changes in vegetation would be greatest in management areas with full timber yield and would be least in management areas with no regulated harvest. Alternatives with higher proportions of the Forest allocated to mangement areas with full or partial yield would cause relatively more change to forestwide vegetation.

Table S-3 Predicted Change In Vegetation - 5th Decade - Percent of Forested Area

Age Groups (years)	Existing Condi-tion	Alternative							
		NC	A	C	E	F	H	I	Q (Preferred)
0-29	8	12	10	11	9	6	5	7	9
30-69	7	17	15	17	17	13	12	13	14
70-119	22	7	7	7	7	7	7	7	7
120-169	26	21	21	20	21	21	21	19	19
170 +	37	43	47	45	46	53	56	53	51

Figure S-9 Management Intensity - Percent of Forested Area



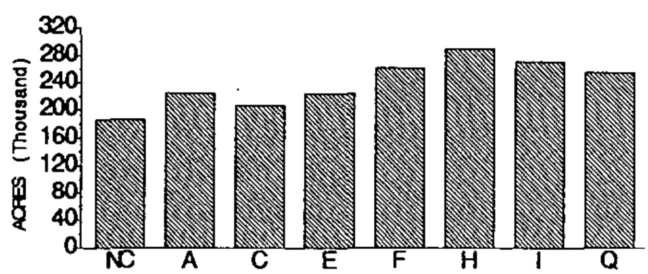
Old Growth

Timber harvest as prescribed by the various alternatives affects the amount of old growth retained on the Forest. When a stand of old growth is harvested, the characteristics and values which make it old growth are gone. Acres of existing old growth remaining in each alternative after fifty years are shown in Figure S-10.

All alternatives retain, at a minimum, the old growth within withdrawn areas, including the Wildernesses and Research Natural Areas. Old growth may also be retained in several of the management areas which do not provide for scheduled timber harvest, in addition to those acres protected in the old growth prescription. All management areas with no harvest potentially have younger stands which could, in time, develop old growth characteristics.

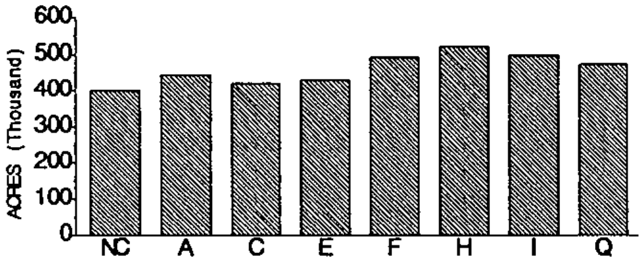
Those allocations without timber harvest will be effective in maintaining old growth character. Some alternatives provide for more no-harvest areas than others. There are no effective measures against natural catastrophes from insects, disease or wildfire.

Figure S-10 Acres of Existing Old Growth Remaining after 50 Years



Current = approximately 345,000 acres

Figure S-11 Acres of Potential Old Growth, Including Ingrowth, Existing after 50 Years

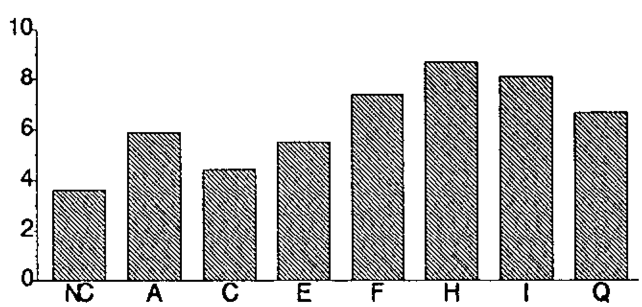


Current = approximately 345,000 acres

Aquatic Resources

The impacts of management activities are assessed on two major aquatic resources: fish habitat and water quality. The Forest's aquatic resources are affected by all alternatives due to the disturbance of soil and vegetation, which indirectly affects the hydrologic and riparian resources. An aquatic Habitat Stability Index was used to estimate future aquatic ecosystem stability. The higher the index, the better the condition of the habitat.

Figure S-12 Forestwide Aquatic Habitat Stability Index After 50 Years

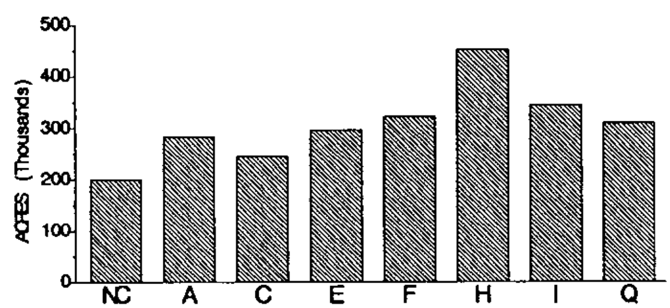


Wildlife

The main effects of the alternatives on wildlife would occur from changes in habitat types and in diversity of forest condition classes. Changes in habitat result in changes in populations of associated species. No single set of habitat conditions can be "best" for all wildlife species. To evaluate effects on wildlife, the impacts on each species or group of species (as represented by an indicator species) was determined.

Because different animal species respond differently to changes in habitat types and forest condition classes, the effects of the alternatives are primarily displayed by indicator species. Species that are dependent upon habitat conditions similar to those of the indicator species are expected to be affected in a similar manner and degree to the indicator species.

Figure S-13 Suitable Habitat Protected for all Management Indicator Species



Visual Resource

The management activities that would affect the visual resource are primarily timber harvest activities and road building. All management activities are guided by Visual Quality Objectives (VQOs) designed to blend the activity with the natural landscape character so that the effects are within acceptable limits. Figure S-6 displays the VQOs that would be associated with each alternative. Land assigned the Preservation VQO would be natural appearing. Retention areas would appear unaltered to the casual viewer, Partial Retention areas would appear slightly altered, and the Modified areas would appear moderately to substantially altered.

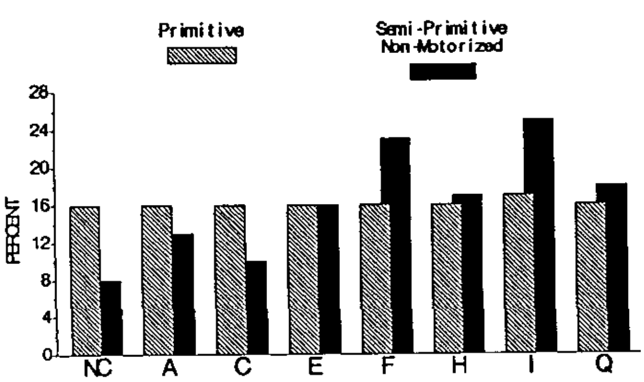
Implementing the visual management system is expected to be effective - unit size, percent of openings, and target tree sizes are provided.

Recreation

Although some recreational activities such as camping can occur in almost any recreation setting, many people choose different recreation settings for different recreation experiences. The Recreation Opportunity Spectrum (ROS) describes the different settings in terms of the recreation experiences these settings can offer. Refer to Chapter III for definitions of the ROS classes.

Vegetative manipulation, timber harvest, road construction, and access management are major activities that affect recreation settings. For example, roading and timber harvest increases access for motorized travel, but at the same time they affect the "naturalness" of an area and discourage those seeking a nonmotorized experience in a natural environment. The changes in recreational settings vary by alternative according to different levels of timber harvest and road construction.

Figure S-14 Percent of Primitive and Semi-primitive Nonmotorized Demand Supplied in Year 2040



Probable Adverse Environmental Effects That Cannot be Avoided

Implementation of any of the alternatives will inevitably result in some adverse environmental effects that cannot be avoided. The degree of severity of the adverse effects can be minimized by adhering to the direction in the management prescriptions and Forestwide Standards and Guidelines in Chapter IV of the Forest Plan, but some impacts generally cannot be avoided if any management activities occur.

Soil disturbance occurs as a result of timber harvest slash treatment, wildfires, and construction of utility corridors, roads, trails, and recreation sites. Both the technique and the scheduling of management activities can affect the kind and amount of impact that can occur on soil resources. This is also true for water resources. Short-term effects on water are a result of management activities such as timber harvest, wildfire, livestock use, and recreation use.

Effects on visual quality are generally of a short-term nature from activities such as timber harvest. Long-term effects on scenery would be from wildfire, roads, and utility corridors.

Air quality may be temporarily degraded in localized areas by both prescribed fire and wildfire. Wildlife can be adversely affected by fire, small hydro development, and timber harvest activities. And finally, it is likely that some significant cultural resource sites will inadvertently or unavoidably be disturbed.

Short-Term Uses vs Long-Term Productivity

The relationship between the short-term uses of man's environment and the maintenance and/or enhancement of long-term productivity is complex. For the purposes of this assessment, short-term uses are those that generally occur on a yearly basis on some area of the Forest, such as timber harvest as a use of the wood resource, livestock grazing as a use of the forage resource, and recreation and irrigation uses of the water resource.

"Long-term" refers to longer than a 10 year period. Productivity refers to the capability of the land to provide market and amenity outputs and values for future generations. For example, maintenance of long-term soil productivity requires that activities which cause excessive erosion, compaction, and other adverse impacts to soil be mitigated. Occasionally short-term uses will cause substantial damage to isolated areas. Direction in Chapter 4 of the Forest Plan contains management requirements designed to protect soil and water resources so that long-term productivity is not significantly impaired.

Irreversible or Irretrievable Commitment of Resources

Acres committed to roads and facilities constitute an irretrievable loss of vegetative production and an irreversible loss of soil productivity. When roadless areas are developed they represent an irreversible effect on the roadless values associated with them.

Timber resources can be irretrievably lost by being dedicated as old growth or by being located within designated wilderness. Insects, disease and fire can also cause irretrievable losses. Use of mineral and energy resources can have both irreversible and irretrievable effects.

Chapter I

Purpose and Need

CHANGES BETWEEN DRAFT AND FINAL

The Draft Environmental Impact Statement (DEIS) and Proposed Land and Resource Management Plan (Forest Plan) were made available for public review January 15, 1988. In response to the concerns expressed during the public comment period, the Mt. Hood National Forest has changed the DEIS and Forest Plan. Chapter I of this FEIS differs from Chapter I of the DEIS in several ways. Based on public input, the issues identified in the DEIS have been updated to reflect the change in emphasis or aspect of some issues.

Changes that have occurred since the DEIS was published are incorporated into this FEIS. These changes include:

- Old growth has been re-emphasized as an issue in its own right.
- The 1972 Timber Inventory was completely replaced with new data collected in the 1986 Vegetation Inventory.
- Land Suitability for timber management was completely reevaluated in 1988.
- Direction contained in the spotted owl supplement to the Regional Guide is incorporated.
- In July 1990, the Spotted Owl was listed as a threatened species by the U.S. Fish and Wildlife Service.
- Five rivers were designated as Wild, Scenic, and Recreational Rivers by the 1988 Oregon Omnibus Wild and Scenic Rivers Act. Portions of eleven rivers were found eligible for Wild, Scenic, and Recreation River status.
- The Regional "Managing Competing and Unwanted Vegetation" FEIS, Record of Decision (1988), and Mediated Agreement (1989) has been incorporated.
- The 1986 Columbia River Gorge National Scenic Area Act.

Table of Contents

CHAPTER I - PURPOSE AND NEED

Introduction

The Mt. Hood National Forest has proposed and analyzed eight alternatives for managing the Forest's land and resources. This Final Environmental Impact Statement (FEIS) documents the analysis of those alternatives (see Chapter II for a detailed analysis of alternatives). The FEIS also describes the environment which would be affected (see Chapter III) and the environmental consequences of implementing each of the alternatives (see Chapter IV). The objective of Chapter I is to explain the purpose of and need for the FEIS.

The purpose of this FEIS is to provide decision makers (Regional Forester) with a detailed analysis of our Forest issues. The FEIS provides the basic information needed to select a forest land management plan. Equally important, the FEIS supplies the public with information on the alternatives' environmental impacts, including those anticipated when the Land and Resource Management Plan (the Preferred Alternative) is implemented.

The Forest's identification of a Preferred Alternative is based on public comment on the Draft Environmental Impact Statement (DEIS) and on the analysis in this FEIS. The Preferred Alternative identified in this FEIS is the basis for the accompanying Mt. Hood National Forest Land and Resource Management Plan (Forest Plan). This Plan will direct and guide all natural resource management activities on the Mt. Hood National Forest. For purposes of National Environmental Policy Act (NEPA) disclosure, the FEIS and the Forest Plan are considered combined documents. Included in this document set is the the Record of Decision (ROD), which describes the basis for the Forest Service decision to approve this Forest Plan.

Each of the FEIS alternatives presents a different way to:

- address local, regional, and National public issues and management concerns;
- provide for the use and protection of Forest resources; and
- fulfill National legislative requirements.

Each alternative displays a different mix of goods and services that could be provided by the Mt. Hood National Forest.

Each alternative was evaluated to determine its adherence to the guiding principles of multiple use and sustained yield management (as directed by the Multiple-Use Sustain-Yield Act of 1960). Multiple-use is the management of all the various renewable surface resources of the national forests so that they are utilized in the combination that will best meet the needs of the American people. Sustained-yield is 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. In addition, each alternative was evaluated to determine it's potential to maximize long-term net public benefits (NPB) in an environmentally sound manner. NPB is an attempt to represent the cumulative net value of all forest outputs and activities. These outputs and activities include all positive and negative impacts on environmental, economic, and social factors. Alternatives were also evaluated to determine how well each responds to the Public Issues. The Preferred Alternative is that alternative which, in the considered opinion of the Forest Service, would best meet these objectives.

The Forest Plan establishes management direction and associated objectives for the planning period. The planning period is defined as the next 10 to 15 years. The expected future condition is projected to the year 2040 (the planning horizon). Within the planning period, Forest conditions will be reanalyzed every 5 years, and under certain circumstances, the Plan may be revised.

Due to the length and complexity of this FEIS, Appendices, and accompanying Forest Plan, aids are provided to help the reader locate specific subjects. A Table of Contents is located at the beginning of the FEIS and at the begining of each chapter. These provide information regarding the organization and general content of the documents. The Glossary defines terms, units, and abbreviations, and is located after the last chapter. An Index to key subjects is also located after the last chapter.

Planning Process

Basic Laws and Regulations

All steps in the Forest's planning process are governed by legal requirements and special regulations. Where possible, shorthand terms or abbreviations for applicable laws and regulations will be used.

Following are some of the applicable laws and regulations:

NEPA. National Environmental Policy Act. It was passed in 1969. This law requires the preparation of environmental impact statements for every major Federal action which causes a significant effect on the quality of the human environment.

RPA. The Forest and Rangeland Renewable Resources Planning Act. It was passed in 1974. This law has two major requirements:

- It requires assessments of the status of the nations forest and range resources.
- It requires the Forest Service to prepare programs for the management and use of those resources.

NFMA. The National Forest Management Act. It was enacted in 1976. This law amends RPA and requires each of the 123 national forests to prepare plans for the management of their resources.

40 CFR , Parts 1500-1508. Title 40 of the Code of Federal Regulations (CFR). These regulations are sometimes referred to as CEQ (Council on Environmental Quality) regulations. They implement NEPA and give instruction for the development and content of Environmental Impact Statements.

36 CFR Part 219. National Forest System Land and Resource Management Planning Regulations. These regulations were required by the RPA, as amended by NFMA, and provide the steps and procedures which must be followed in the development of forest plans.

FSM 1901 and 1920.1. Forest Service Manual section 1901 and 1920.1. These sections govern Forest Service planning process and the implementation of plans.

Regional Guide Requirements. Additions and clarifications are often added by the Pacific Northwest Region (Region 6) to supplement national and legal requirements.

National, Regional, and Forest Planning Linkages

The Forest Service planning process operates on three levels.

National. At the National, or agency-wide level, RPA programs have established national policy and program guidance. These are based on estimates of supply and demand. Regional guides provide an interface between the national RPA strategic plan and the more geographically specific plans.

Regional. At this level, each Regional Forester develops a Regional Guide. Regional guides link the national and local planning processes by channeling information and program guidance between the RPA Program and the individual forest plans. Another purpose of a Regional Guide is to establish regional management standards and guidelines. When a Regional Guide is amended or revised, the Forest may also amend or revise its plan to remain in compliance.

Forest. At this level, each National Forest prepares a Forest Plan utilizing local information. Each Forest Plan applies only to the Forest for which it is designed. It is the guiding document for management on the ground. Before on the ground activities take place, site specific analysis is conducted, and proper NEPA documents are prepared.

Forest planning procedures are an on-going, two-way process. Information regarding planning procedures from the Forest flows up to the national level. There, it is incorporated into RPA programs. Then it flows back to the Forest in terms of RPA objectives. Information regarding resource capabilities and demands provided by each National Forest is part of the RPA Assessment (updated every 10 years) and Program (prepared every 5 years) submitted to Congress.

Budget Process

The annual Forest budget planning process, and the approved Forest Plan schedules and costs, assist in forming an annual program budget that corresponds to congressional appropriations. Budget requests will be based on the Forest Plan, but the Plan is not a budget document. Since the annual budget appropriations have major effects on forest management activities, many of the Forest's goods, services, and environmental effects are ultimately determined in large part by the annual funding process.

Planning Steps

The development of the FEIS and accompanying Forest Plan followed the planning process specified in NFMA implementing regulations and the environmental analysis process. The environmental analysis process is outlined in the Council on Environmental Quality (CEQ) implementation regulations.

The planning steps used to develop the FEIS and Forest Plan are:

Identification of purpose and need. Identify the public issues and how the Forest will measure it's response to these issues.

Development of planning criteria. Determine the rules that will apply to data collection, analysis, formulation of alternatives, and decision-making.

Inventory data and collection of information. Identify the resources (physical, biological, social, and economic) that exist on the Forest.

Analysis of the Management Situation. Determine the Forest's capability to produce various resources. Is there a perceived need to change management direction?

Formulation of alternatives. Develop different management scenarios for the Forest, in response to the issues.

Estimation of effects of alternatives. Identify the changes in the physical, biological, social, and economic environment for each alternative.

Evaluation of alternatives. Compare each alternative with respect to the public issues identified in Chapter I.

Identification of preferred alternative. Determine the best possible management plan under the circumstances.

Approval of Plan. The responsible official approves the plan.

Monitoring and evaluation. The Forest regularly reviews whether it is meeting its planned objectives, and whether all activities comply with the direction established by the Plan.

This FEIS presents the results of the environmental analysis obtained by completing the first eight of the ten planning steps. Following the publication of the DEIS, government agencies and the public were asked to comment on the DEIS and Proposed Forest Plan. The comments received from the public were used to evaluate the results of the first seven planning steps, and guided the changes made to the DEIS and the proposed alternative identified in the Draft Forest Plan. Appendix J (Response to Public Comment) describes the public involvement process between DEIS to FEIS. Appendix J:

- Recaps the DEIS public participation activities.
- Summarizes the comments received.
- Lists substantive comments received and the Forest's response to those comments.
- Reprints comments received from elected officials, governmental agencies, and Native American Tribal Governments.

The FEIS will be used by the Regional Forester to make a decision regarding approval of the Forest Plan. This decision is documented in the Record of Decision (ROD), which accompanies this FEIS and Forest Plan. Issuance of the ROD will complete planning step 8 and initiate the last planning step.

The Forest Plan shall ordinarily be revised on a 10 year cycle or at least every 15 years. The Forest Supervisor shall review conditions on the land covered by the Plan at least every 5 years to determine if conditions or demands of the public have changed significantly. The Forest Plan may be amended or revised at any time if conditions warrant.

Planning Records

All persons interested in the Mt. Hood National Forest planning process may review the relevant documents and files at the Forest Supervisor's office. The Supervisor's office is located at 2955 N.W. Division Street, Gresham, Oregon 97030. These documents and files contain the environmental analysis and other detailed information used in the development of the FEIS and the Forest Plan. Readers will find the planning records incorporated by reference at pertinent points in the FEIS, FEIS Appendices, Forest Plan, and ROD.

Tiering Environmental Assessments

Upon implementation, The FEIS and Forest Plan will be used for "tiering" in accordance with CEQ regulations. A tiered document makes reference to information found in existing documents, rather than repeating that information. An example of tiering is found in Environmental Assessments (EA's), which conduct analysis for site specific projects. EA's may be tiered to the FEIS by referencing information written in the FEIS. Similarly, the FEIS may be tiered to the Regional Guide. Tiering allows site-specific documents to focus on project related issues, rather than repeating information from documents prepared for Forestwide, Regional, or National issues.

Previous Plans

The Forest Plan supersedes or incorporates all existing land and resource management plans for the Forest. Table I-1 lists these plans and shows those which will be maintained, revised and maintained, and superseded. Appropriated budgets may alter the schedule of implementation of the Forest Plan. In addition, all permits, contracts and other instruments governing the use and occupancy of National Forest Lands must comply with all provisions of the Forest Plan. Such documents shall be revised where needed as soon as practicable (generally within three years).

Mt. Hood National Forest Highlights

This part of Chapter I will focus on the distinctive characteristics of the Forest, rather than to attempt to describe the tract of land in detail. For a more complete description of forest resources, please see Chapter III of the FEIS. Chapter III also provides references and additional sources of information.

Location

The Forest is directly east of the City of Portland, and extends north to the Columbia River. Most of the Forest lies in Multnomah, Clackamas, Hood River, and Wasco counties. A small portion of the Forest that is adjacent to the Willamette National Forest is located in Marion and Jefferson counties. The Warm Springs Indian Reservation is located next to the southeast border of the Forest. The lands of the Forest straddle the Cascade Mountain Range. The largest acreage is found on the west side of the Cascade Mountain Range, and the smaller portion is on the east side. The Forest is divided into seven Ranger Districts as shown by the boundaries and headquarters.

Map I-1 shows the location of the Mt. Hood National Forest with regard to the United States and the Pacific Northwest Region. Forest lands exceed one million acres, which is an area larger than some states.

Origin

The Forest's origins trace to 1892, with the formation of the Bull Run Forest Reserve. The reserve was established when the city of Portland became concerned about its water supply and sought Federal legislation to assure an ample flow. Congress created the Bull Run Forest Reserve to meet the City's needs, and the Bull Run has supplied water to Portland since that time.

On September 28, 1893, the Cascade Range Forest Reserve was created. The Cascade Range Forest Reserve set aside portions of the Cascade Mountains, from the Columbia River south to the California border. A series of adjustments were made to the Forest boundaries, and the name was changed to the Cascade Forest Reserve in 1907. In 1908, the Cascade Reserve was divided into several National Forests; the northern portion was merged with the Bull Run Reserve and named the Oregon National Forest. In 1924, it was renamed Mt. Hood National Forest.

Table I-1 Status of Existing Plans Under the Forest Land and Resource Management Plan

Plans to be Maintained *	Plans to be Revised, then Maintained	Plans to be Superseded
Planning Unit Plans		
Bull Run FEIS		Mt. Hood Planning Unit
		Huckleberry EIS
		Badger-Jordan
		Dalles Municipal Watershed
		Roaring River/ Salmon River EIS
		Eagle Creek Watershed
District Multiple Use Plans		
		All Districts
Range Allotment Plans		
Long Prairie		Roaring River
White River		Horsetail
Wapinitia		Highrocks
Clackamas Lake		
Badger and Grasshopper Coordinated Resource Plans		
Resource Plans		
Rock Resource	Geothermal Leasing Analysis	
Forest Noxious Weed	Road Maintenance	
Ownership Adjustment		
Bagby Research Natural Area		
Timber Plans		
	Tree Improvement Program	Forest Timber Management Plan
Fire Management Plans		
Forest Aviation	Fire Management Action Plan	
Recreation Plans		
Columbia Gorge Outreach	Timothy Lake Area	Eagle Creek Limited Area
Timberline Interpretative	Off-Road Vehicles	
	Visitor Information Service	
Ski Area Master Plans		
Mt. Hood Meadows Ski Area FEIS	Multipor Ski Bowl	
Timberline Lodge FEIS		
Special Interest and Unusual Interest Area Plans		
	Bagby Hot Springs Geological Area	Bull of the Woods Scenic Area
	Little Crater Lake Geologic Area	
	Olallie Lake Scenic Area	
	Parkdale Lava Beds Unusual Interest Area	
	Suger Pine Unusual Interest Area	
Historic Area Plans		
Clackamas Lake Ranger Station Historic Site Management	Columbia Gorge "Old" Wagon Road	Cloud Cap Inn Unusual Interest Area
	Barlow Tollgate Historic Area	
	Barlow Road Management	
Recreation Trail Plans		
Pacific Crest National Scenic Trail	District Trail Development Management (one per District)	

* *When the Management Plan for the Columbia River Gorge National Scenic Area is adopted by the Columbia River Gorge Commission, the Forest Plan will be amended to incorporate the management direction outlined in that plan.*

Map I-1 Mt. Hood National Forest Location Map

By 1915, Portlanders were pressing to make Mount Hood a national park. Through the years, the area's population grew, and new and improved highways made Mount Hood and the Columbia Gorge easier to reach. In response to public demand in the early part of this century, recreation on the Forest received special emphasis. At that time, the Secretary of Agriculture designated, through an Executive Land classification order, the Mt. Hood Recreation Area and the Columbia Gorge Park Division of The Oregon National Forest. This order directed that the administration and use of the areas emphasize the preservation of the scenic beauty, recreation use, and public enjoyment. coordinately with the purposes for which the Oregon National Forest was established. Under current management, both of these areas receive special emphasis for recreation use.

Social and Economic Aspects

The Portland metropolitan area, with a 1989 population estimated at 1.2 million people, exerts the most significant social and economic influences on the Forest. The area has a diverse economy, and has experienced an above-average growth. By living only 50 miles from the Forest, most of Portland's residents can reach the Forest's more accessible areas in less than an hour's drive.

Communities situated along major highways that reach the Forest depend largely upon business generated by recreational visitors to the Forest. More than three and one half million visitors a year come to such popular attractions as Timberline Lodge on Mount Hood, and Multnomah Falls in the Columbia Gorge.

Two hours is sufficient for more than a hundred thousand people in other nearby areas, including the Native Americans on the Warm Springs Reservation, to reach many of the Forest's most popular recreation sites. These people rely on Forest resources for purposes which vary from recreation to employment to cultural enrichment.

In contrast to the urbanized counties on the west side of the Forest, counties on the east are sparsely populated and rural. Current estimates place the population of Hood River and Wasco Counties on the east side of the Cascade crest at less than 40,000. Although this represents less than 4% of the nearby population, these relatively small local communities are recognized as integral members of the National Forest community. Orchards abound in Hood River Valley. Ranching, farming, and timber production are mainstays of the Wasco County economy. Timber is a major factor in the economies of several small communities close to the Forest.

One of the most important economic factors for communities in counties adjacent to the Forest is the payments to counties made from Forest Service receipts. These communities receive Forest Service receipts from commodity sales, and receive payments made in lieu of taxes. The Forest Service receives receipts from a variety of activities such as grazing, recreation and other permits, mineral leasing, the sale of rock, and timber harvest. Timber harvest contributes the largest receipts of the Forest. Counties receive 25 percent of these receipts. Refer to Chapter III, Socioeconomic Overview section, for more details and amounts counties receive.

Physical and Biological Features

It is impossible to consider the whole Forest without looking at its parts. Forest features vary from flower-decked meadowlands to trees that are so tall and wide that sunshine barely penetrates to the forest floor. In the Columbia Gorge, waterfalls plunge a hundred feet or more, while glacial lakes above the timberline lie deep and still.

Majestic Mt. Hood dominates the Forest. Mt. Hood was named by Lt. William Robert Broughton in 1792 for Lord Samuel Hood, a noted British naval officer. This giant mountain is more than two miles high and never loses its cap of snow. The snow cap often hides in the region's morning clouds. Mt. Hood is one of the many volcanoes in the Cascade Mountain range. With an elevation of 11,235 feet, it is the tallest peak in Oregon, and one of the tallest in the Northwest.

The Pacific side of the Forest is virtually a different climatic and biological world, compared to the east side. The prevailing westerly winds from the Pacific Ocean bring moisture to the west side that falls as rain in lower areas, and as seasonal snow at higher elevations. The climate of the west side's lower areas is therefore mild and wet. Plant life on the west side reflects the climate. It is dominated by Douglas fir trees in dense, cathedral-like stands of old growth, or by open stands carpeted with colorful flowers. The alpine meadows in higher elevations are covered during the spring and summer with spectacular displays of wildflowers.

Since most of the region's precipitation falls on the Pacific side of the Cascades, the east side is comparatively dry. Temperatures are also more extreme. Relatively open growths of Ponderosa pine, mixed with oak, dominate the plant life in this more arid climate.

The Forest is bordered on the north by the Columbia River. The Columbia cuts its way through the Cascade Mountains to form the Columbia Gorge. The Gorge is one of the region's most magnificent sights.

Steep rock walls form the face of the gorge, and streams from high in the Forest tumble down these walls in spectacular waterfalls. The most famous of these is Multnomah Falls, the most popular stop for Forest visitors. Ever since the first pioneer set foot in this region, there has been concern about who should manage the Columbia River Gorge, and in what way. November 17, 1986, marked a turning point for the Columbia River Gorge. President Reagan signed into law an act creating a Columbia River Gorge National Scenic Area. The new law (Public Law 99-663) laid a foundation for a cooperative effort to protect and enhance the scenic, cultural, and recreational resources of the Gorge, and to encourage compatible economic growth and development.

Resources

About one-third of the Forest's extensive stands of timber is dominated by very large trees two hundred or more years old. In addition to the obvious supply of timber, the Forest contains other resources such as water, fish, wildlife, undeveloped and developed recreation facilities, and extraordinary scenery. These resources offer a wide range of opportunities and benefits to people in all walks of life.

The production of timber is an important function of the Forest, and is especially important to many smaller communities close to the Forest. People in nearby towns depend on the sawmills to provide them with employment. Forest stands are also important to the ecology of the forest, as they provide habitat for wildlife and wilderness experiences for human visitors.

Recreational opportunities for Forest visitors range from downhill or cross-country skiing to wilderness hiking, or just contemplating nature. Both the mountain climber and the sightseer may find many personal forms of relaxation and renewal. People living in heavily-populated metropolitan Portland have found the recreational resources of the Forest to be a major contribution to quality of life in the city.

While timber and recreation are important Forest resources, neither of these would flourish without the Forest's water. Approximately 40% of the people in the state of Oregon, including Portland, other cities, and water districts, drink water that originates on the Forest. Portland residents have expressed great pride in their unique water resource, the Bull Run Watershed. Forest water is also used by nearby agricultural communities for irrigation.

Many streams and lakes provide habitat for a variety of fish within the Forest. The most recreationally important of these are trout, and the famous northwest salmon. Salmon are typically an "anadromous" species. Anadromous fish spawn in fresh water and grow to maturity in salt water. Their life cycle makes them highly sensitive to changes in water conditions. People of the northwest, especially Native Americans, are sensitive about conditions that affect the quantity and quality of anadromous fish.

At this time, the Forest contains more than 300 miles of rivers and streams suitable as anadromous fish habitats. However, the Forest also has the potential for measurable increases in the amount and production capability of habitat for this species. An increase in the fish habitat would contribute to future increases in Columbia River anadromous fish yields, with corresponding benefits to the social, economic, and cultural well-being of the region.

Not the least of the Forest's natural resources is its wide range of wildlife. Visitors to the Forest get a special thrill when they catch sight of wild animals, whether it is a spectacular pileated woodpecker, a shy deer, or a thousand-pound elk.

Issues, Concerns, and Opportunities

Introduction

The Mt. Hood National Forest is made up of complex natural and social systems which can be managed for different mixes of resource outputs, land uses, and environmental conditions. Different people and different groups look upon the resources of the Forest in light of their individual interests; therefore, they would like to see the Forest managed in ways that satisfy those interests. However, the resources, land uses, and environmental conditions of the Forest are interconnected, and management that emphasizes one of these can produce changes in others. Trade-offs are necessary, but the challenge of forest planning is to find a mix of resource emphases that is agreeable to as many individuals or groups as possible, while maintaining the quality of the environment.

A starting point in this effort to find the best mix of resource emphases is to identify what the public wants from the Forest, and determine what the Forest is capable of providing. To this end, Issues, Concerns, and Opportunities (ICOs)were identified. ICOs are what drive the development of alternative ways to manage the Forest.

Public Issues, Management Concerns, and Resource Use and Development Opportunities are defined as follows:

Public Issue. Subjects or questions of widespread public interest relating to the management of the National Forest resources.

Management Concerns. An issue, problem, or condition, identified by the Forest Service, that can potentially limit the way resources are managed.

Resource Use and Development Opportunities. A proposed activity that presents an opportunity to improve or maintain a current condition. These activities can be proposed by the Forest Service or by the public.

Identifying ICOs for the DEIS

Since the planning process is guided by public issues and management concerns, a fundamental step is the identification of the relevant ICOs. The identification of ICO's began in September, 1979. The Forest conducted an extensive and ongoing process, which utilized public meetings, newsletters, correspondence, and local news media. This process included direct personal contacts by Forest Service personnel. It attempted to incorporate comments and suggestions from a wide cross section of groups and individuals. Input was gathered from both public and private sources. Some of these groups and individuals are: adjacent landowners, adjacent National Forests, agencies of State and local governments, local employers, conservation organizations, and Native Americans.

These early efforts resulted in a preliminary set of public issues. This first effort was supplemented with information gathered in earlier planning processes, and from "brainstorming" sessions conducted by Forest officials. Letters that incorporated the first draft set of public issues were sent to all persons and groups who had expressed interest, or were expected to have interest. These individuals and groups were asked to comment on this preliminary set of issues.

The planning team reviewed and consolidated the comments, in order to develop an initial comprehensive set of public issues. The Regional Forester approved this set in June 1980.

Following the 1980 approval, the process of identifying and assembling public issues continued. Periodic meetings and discussions were held with groups and individuals over the intervening years. Some issues were modified in order to respond to these reviews, and to comply with changes in policies and required procedures. A final set of public issues was prepared. The Regional Forester reviewed this set of issues, and approved them in September 1984. These issues were used as a guide throughout the design and analysis of all alternatives described in the DEIS. This set of issues was also used in identifying the preferred alternative in the Proposed Land and Resource Management Plan. A more detailed description of the process used to identify the original ICO's can be found in Appendix A.

Updating ICOs for the FEIS

The DEIS and Proposed Forest Plan were released on January 15, 1988 and public responses were taken until May 31, 1988. During the public comment period, the Forest held eight public meetings. The purpose of these meetings was to answer questions about the DEIS and Proposed Plan, and to encourage members of the public to comment on the planning documents.

The Forest received approximately 4,800 responses to the Proposed Plan and DEIS. These responses contained over 80,000 comments. Appendix J provides a detailed description of the public participation activities carried out by the Forest during the public comment period; see Summary of Public Participation section of Appendix J. Appendix J also gives a detailed summary of the public comment, and describes how the Forest Service has attempted to respond to those comments in the Final EIS.

Analysis of the public comment confirmed that the public issues identified in the DEIS are still valid. However, in response to public input, the list of public issues has been modified to include two new issues, which focus on the supply of developed recreation and deer and elk management. Other issues were modified or combined to reflect a shift in emphasis as a result of public comment. Old growth has been re-emphasized as an issue in its own right. Unlike the DEIS format, which grouped the issues into six issue groups, this FEIS will discuss issues individually.

The final set of public issues, management concerns, and resource opportunities were used to guide the design and analysis of the alternatives described in this FEIS. The ICOs were also used in identifying the perferred alternative in the Forest Plan. Management concerns and resource opportunities are also addressed through the development of Standards and Guidelines.

The remainder of this chapter will identify the current list of public issues. A discussion of each issue will include:

- Resource conflicts in responding to the issue.
- The opposing interests associated with the issue.
- The indicators of responsiveness to the issue (a way to measure how well the Forest responded to the issue).
- Changes made from Draft EIS to Final EIS concerning the issue.

List of Public Issues

The twelve Public Issues listed below were identified through the process described above, and in Appendix A of the FEIS.

Public Issue 1: Level of Timber Supply on the Mt. Hood National Forest

Public Issue 2: Community Stability

Public Issue 3: Maintenance and Distribution of Old Growth

Public Issue 4: Viable Populations of Spotted Owls and Management Indicator Species

Public Issue 5: Conflicts Between Management Activities and Competing Recreational Activities

Public Issue 6: Maintenance and Enhancement of Scenic Quality

Public Issue 7: Disposition of the Remaining Roadless Areas

Public Issue 8: Diminishing Supply, or Availability, of Resources Traditionally used in Native American Religious and Cultural Life

Public Issue 9: Maintenance and Rehabilitation of Fish Habitat and Water Quality

Public Issue 10: The Supply of Developed Recreation Site Opportunities.

Public Issue 11: Wild, Scenic, and Recreational Rivers

Public Issue 12: Deer and Elk Management

Relationships Between Public Issues

Most of the twelve Public Issues listed above are related to each other. Management activities that affect one resource will usually affect a number of other resources.

Public Issues

Each of the Public Issues is discussed below. The discussion is followed by a presentation of the indicators used to measure the ability of the alternatives to respond to each issue. Lastly, the changes made between Draft EIS and Final EIS which concern the issue, are presented.

Public Issue 1: Level of Timber Supply on the Mt. Hood National Forest

Discussion of the Issue

The level of timber supply is an issue which, perhaps more than any other issue, affects and is affected by the resolution of other resource issues. As a result, this issue involves the largest number of interest groups.

Public comment on this issue was extremely polarized. Members of the public either wanted greatly reduced timber harvest levels, or a greatly increased harvest. This extreme polarization of opinions was reflected in the public's choices of the alternatives proposed to guide the management of Forest lands and resources. Of those who had a strong preference for a particular alternative, the public favored either alternative I, or a new alternative proposed by the Mt. Hood Alliance. Alternative I called for a timber harvest less than that proposed in the Draft Forest Plan, while the new alternative proposed by the Mt. Hood Alliance called for a timber harvest greater than that proposed in the Draft Forest Plan. The high degree of conflict regarding the uses of Forest resources is understandable, given the wide variety of individual interests and needs in the public.

The timber supply issue is important to groups and individuals who favor the direct economic benefits of timber harvesting more strongly than the amenity values provided by the Forest. These groups typically include the timber industry and it's employees, persons living in local communities that are economically dependent on the timber industry, and segments of local, county, and state governments. These groups feel that the Forest Plan should place special emphasis on sustaining regional and local economies. Through their public comment on the DEIS, these groups expressed concern that the Forest should maintain or increase current harvest levels. These groups were also opposed to the removal of land from intensive timber harvest designation.

The supply of timber from private lands is expected to decline from now until the year 2010 (Timber for Oregon's Tomorrow, 1989 Update). Timber Industry groups have expressed the position that the Mt. Hood National Forest should help to fill the supply gap until the private lands reach rotation age. They believe that the goal of the Forest's timber harvest schedule should be to meet the Nation's demand for wood products. Timber industry representatives have expressed the opinion that the Organic Administration Act of 1897 legally mandates that the National Forests be managed for two primary resource products - timber and water. These groups have a major concern about the management of the Forest's non-timber related resources. They believe that this form of management could reduce wood fiber production, and would lead to instability in the forest products industry and local communities. As a result, the timber industry's representatives insist on high level of timber production from the Mt. Hood National Forest.

The timber supply issue is also important to groups and individuals who feel that timber harvests should be decreased, in order to maintain or enhance other resources. Groups concerned about recreation opportunities, water quality, fish and wildlife habitat, and scenic quality have expressed this view in their public comment. In their comment on the DEIS, these groups called for the Forest to reduce the level of timber harvested and to remove more land from intensive timber harvest. Some of these groups also expressed opposition to "clearcutting" as a method of timber harvest.

Although these groups have many diverse interests and concerns, they all hold the position that their interests would be furthered by a reduction in the level of timber harvested on the Forest. These groups point to the increasing demand for noncommodity values. Some are concerned that, at current harvest levels, the Forest is not able to provide adequate opportunities for dispersed recreation. Others are concerned about maintaining the scenic beauty of the Forest. Some groups stress the need to maintain the diversity of plant and animal species on the Forest. They are concerned that higher harvest levels do not lend themselves to providing the necessary habitat conditions for wildlife, including both game and non-game species. Other groups have made an issue of the undesirable cumulative effects of the road building associated with timber harvesting. They hold the position that road building can have undesirable effects on land stability and may cause harmful land movements and erosion. Some groups feel that timber harvest in and near riparian areas will adversely affect wildlife and recreation values, lake productivity, stream bank stability, fish production, and water quality. Many groups have called for a reduction in the level of old growth which is harvested. Several groups are also asking for more stringent standards for determining what land is classified as suitable for managing as timber emphasis. Timber sales with costs exceeding revenue (below cost sales) are also an issue with some of these groups. They believe that these type of sales are a subsidy for the timber industry.

Clearcut harvest methods are a public concern.

Indicators of Responsiveness

The following indicators of responsiveness to the Public Issue *Level of Timber Supply*, will be evaluated in each alternative. The results of the evaluation can be seen in Chapter IV of the FEIS.

- Average Annual, First Decade Allowable Sale Quantity (ASQ). This is the millions of board feet of green merchantable timber offered for bid each year during the first decade. The ASQ consists of volume which is scheduled by the Forest Plan to be harvested (regulated) plus volume which is not scheduled for harvest (unregulated). Salvage is that portion of the unregulated volume which results from timber damaged due to storm, insect, disease, fire, etc.
- Timber Sale Program Quantity (TSPQ). This is the total board feet of timber offered the first decade, including salvage, other saw timber, and other volumes of wood offered, such as firewood. The TSPQ is used as an indicator of timber supply and is used by local timber purchasers and in national planning processes to project timber supplied by the Forest.
- The Long-Term Sustained Yield Capacity (LTSYC). This is the capacity of the Forest to produce green merchantable timber volume in perpetuity (reported in million cubic feet per decade). The LTSYC of the Forest to produce timber varies by alternative and is directly affected by the amount of land allocated to growing trees for harvest.

Changes Made From Draft to Final Regarding the Issue of the Level of Timber Supply on the Mt. Hood National Forest.

- The Vegetative Resource Inventory (Timber Inventory) has been updated to include data collected through September of 1988.
- The inventory of land suitable for timber harvest has been updated (October 1989) to incorporate the updated Vegetative Resources Inventory.

Public Issue 2: Community Stability

Discussion of the Issue

Forest management affects the jobs, incomes, and lifestyles of local residents in nearby communities. Some residents work in the forest products industry, and many choose to live in these communities because of the types of recreational opportunities available in the Forest. Local community people who work in the Forest and use it for leisure activities have an interest in how the Forest is managed.

Flume feeder, Broughton Mill

Many of these small local communities have economies which are largely commodity-based, and strongly rely on the forest products industry for employment. Some members of the public have expressed a concern that proposed decreases in timber harvests will cause decreased economic activity in these communities.

In their comments on the DEIS, timber industry groups stressed that the timber harvest level in the preferred alternative will have an unacceptable impact communities. They believe that the communities on the east side of the Forest will suffer the most impact. A decrease in the level of timber supplied by the Forest could cause loss of jobs for employees of the timber industry.

Many communities are concerned about their timber harvest commodity receipts, and the payments made to their communities in lieu of taxes. They want these payments to remain at current levels or to increase. Timber harvest from the Mt. Hood National Forest produces revenues for the governments of six counties; 25 percent of Mt. Hood National Forest receipts are paid to these counties in lieu of taxes. These funds are used for schools and roads. The management strategy proposed in the Forest Plan, particularly as it concerns timber harvest levels, will have a direct effect on the income to the six counties.

Many of the recreation opportunities provided by the forest have an economic impact on small recreation oriented communities such as Welches and Rhododendron. This includes communities such as Estacada, which are associated with river recreation activities. Many people feel that non-commodity resources such as unroaded recreation and wildlife can be emphasized to broaden and diversify the economic base. There is also a concern that other management activities such as timber harvesting and road development could infringe upon these noncommodity values.

The lifestyles of local residents are tied to the Forest in many ways. The Forest provides resources that are important to local residents even though there is no direct economic tie. Many of these people choose to live in communities near the Forest because of the wide variety of amenities available. These amenities include clean water, visual quality, wildlife, recreation, and firewood cutting. Residents of the Portland metropolitan area also see the Forest as adding to their quality of life. The city's closeness to the forest makes possible a lifestyle which may include a diverse range of recreational activities.

Indicators of Responsiveness

The following indicators of responsiveness to the Public Issue *Community Stability* will be evaluated for each of the alternatives.

- Average Annual Payments to Counties within the Influence Area. These are the first decade average annual amounts paid by the U.S. Treasury to counties, from Forest commodity sales receipts. The revenue from the direct payments to counties, derived from Forest commodity sales receipts, indicates the relationship of Forest management practices to the stability of local communities. This relationship will vary with each alternative.
- Changes in Jobs. These changes are in relation to current employment levels. The health of communities may be indicated by the employment generated from Forest goods and services.

Changes Made From Draft to Final Regarding the Issue of Community Stability

- The 1982 IMPLAN database is being used.
- The IMPLAN model includes six counties: Clackamas, Hood River, Multnomah, Wasco, Washington, and Yamhill.
- Chapter IV of the FEIS discusses impacts to individual communities.

Public Issue 3: Maintenance and Distribution of Old Growth

Discussion of the Issue

The future of old growth stands on the Forest is an issue that has recently received substantial debate and has heightened as a widespread public concern. Originally dealt with in the DEIS as a wildlife habitat concern, it has now assumed additional scope. Old growth is now recognized as a valuable ecological entity in itself, as well as for its visual, recreational, scientific, wildlife habitat, and other values.

Interest has grown in preserving remaining old growth communities for various reasons. Many environmental groups and individuals value old growth communities for their aesthetic qualities. Some contend that portions of the Forest in these older age classes should be preserved as part of the natural diversity of the forest or the ecosystem. These stands of old growth provide habitat for numerous species of wildlife and plants. These include the northern spotted owl (recently listed by the USDI Fish and Wildlife Service as a threatened species) and Kruhsea (Streptopus streptopoides) which is a small plant listed as a candidate for federal listing by the USDI Fish and Wildlife Service. Environmental groups hold the position that old growth forests are needed in substantial acreages over a wide distribution. They contend this is necessary to sustain viable populations of dependent plants and animals, as mandated by the National Forest Management Act (1976). Old growth areas are also valued for providing recreational opportunities, and for the protection of domestic watersheds. Some individuals have stated that centuries-old living trees should not be felled and converted to wood products for human use. Environmental groups have voiced concerns that old growth forests are declining too rapidly, because of timber harvest rates that exceed a sustainable level.

Representing another facet of the old growth issue are those who contend that enough old growth has already been designated for preservation. Timber industry interests have stated that enough land is removed from timber management through "reserved" lands, such as: Wilderness, Research Natural Areas, Special Interest Areas and, recently, Spotted Owl Habitat Areas (Final Supplement to the Environmental Impact Statement for an amendment to the Pacific Northwest Regional Guide - Spotted Owl Guidelines, 1988). This viewpoint suggests that these reserved lands provide adequate amounts of old growth to both; 1) meet habitat requirement for sustaining viable populations of associated plant and animal species, and 2) provide aesthetic values for future human generations. Timber industry representatives suggest that the remaining non-reserved stands of old growth should be harvested. This would help support today's timber industry and allow for the establishment of young conifer stands to support the industry in the future. These remaining old growth stands often contain the highest timber volumes per acre and the highest quality wood for manufacturing.

Another aspect of the old growth issue is the potential wood production that is not realized as long as these lands are occupied by relatively slow growing old stands. The old growth stands often produce little net growth in merchantable wood fiber. In some cases, there are net losses due to individual tree decay and mortality.

Old growth forest.

Clarity of the old-growth issue is markedly confounded by the lack of a widely accepted definition of old growth. Many Forest visitors may view old growth as simply large, old trees that are esthetically pleasing. Ecologists offer definitions which require old growth stands to have specific physical attributes, e.g. multiple layers in the forest canopy, substantial quantities of standing decaying or dead trees and fallen trees in various stages of decomposition. Traditional timber management culture would have defined old-growth simply as a forest stand with dominant trees of a certain age, e.g. 200 years old (as was used in the DEIS). For a discussion of the old growth definitions used by the Forest, see FEIS Chapter III, old growth section.

Also clouding the old growth issue is the tendency to equate old growth with the spotted owl habitat (see Public Issue #4). Typically, old growth stands which meet ecologist's definitions will provide suitable habitat for spotted owls, if the stands cover sufficient acreages. However, spotted owls may, in some cases, make use of habitat conditions that do not meet the strict ecologically based definitions of old growth.

Public comments questioned the adequacy of the old growth inventory used in developing the DEIS. In response, the Forest used the updated Forest vegetative inventory (Vegetative Resource Inventory, 1989) to approximate the amount and location of old growth on the Forest. The Forest does not have a detailed inventory of forest stands which includes all of the structural attributes of old growth. The vegetative inventory was used to approximate those overstory tree size and species combinations that correlate highly with the old growth stand characteristics (See FEIS Chapter III, old growth section).

Indicators of Responsiveness

The following indicator of responsiveness to the Public Issue *Maintenance and Distribution of Old Growth*, will be evaluated in each alternative:

- Acres of old growth remaining by decade for 50 years. The PNW-447 definition of old growth is used where applicable and the Pacific Northwest Regional Guide definition is used for the rest of the Forest. See FEIS Chapter III for a more detailed discussion of the old growth definition used by the Forest.

Changes made from Draft to Final regarding the issue of Maintenance and Distribution of Old Growth

- The amount and location of old growth on the Forest was approximated using the updated Forest inventory (Vegetative Resource Inventory, 1989).

Public Issue 4: Viable Populations of Spotted Owls and Management Indicator Species

Discussion of the Issue

Management of habitat for sensitive, threatened, endangered, and "indicator" animal species has recently become a volatile public issue. Individuals and groups are divided on the issue of habitat protection. Many have urged the Forest Service to recognize declining or "diminishing" species and to respond by providing high levels of habitat protection. They have indicated that current Forest Service management is inadequate for the preservation of viable populations of some species. Numerous comments were received expressing concern that timber harvest has detrimental effects on wildlife species especially those dependent upon mature and old growth coniferous forests.

Other individuals and groups have expressed concern that the Forest may unnecessarily protect large amounts of forest land as wildlife habitat. Many have argued that species (e.g. northern spotted owl) the Forest is currently providing management protection for are more adaptable than biologists have determined, and therefore extensive habitat protection is unwarranted. Many have suggested that reductions in timber harvest due to retention of forest land for protection of wildlife species is unacceptable. This sentiment particularly applies to protection of mature and old growth habitat.

The northern spotted owl is a mature forest and old growth habitat associated species that lies at the center of this controversy. This controversy is clouded by the confusion and disagreement over what is suitable habitat for the spotted owl. Typically, forest stands which meet ecologist's definitions of old growth will provide suitable habitat for spotted owls, if the stands cover sufficient acreages (Final Supplemental Environmental Impact Statement to the Pacific Northwest Regional Guide (FSEIS), December 1988). Many esthetically pleasing stands with large, old trees do not have sufficient intrastand structural characteristics or do not cover large enough acreages to contribute as effective habitat for spotted owls. In addition, spotted owls may often make use of forest stands of younger age classes (e.g. wild fire resultant stands of 100 to 200 years of age) which have remnant patches of old growth trees or snags persisting from earlier old growth stands. For a discussion of the old growth definitions used by the Forest, see FEIS Chapter III, old growth section.

Northern Spotted Owl

The opinions of groups and individuals vary on what quantity of habitat should be maintained to insure the continued survival of the spotted owl. The spotted owl requires a relatively large amount of habitat to forage and nest successfully (Final Supplemental Environmental Impact Statement to the Pacific Northwest Regional Guide (FSEIS), December 1988). The FSEIS directed the Forest to maintain management areas for the spotted owl dispersed throughout the Forest. Each management area should contain at least 1,500 acres of suitable spotted owl habitat. A network of sixty-six spotted owl habitat areas has been identified across the Forest (see map in Chapter III, Spotted Owl section). In July 1990, the northern spotted owl was listed as a threatened species by the U.S. Fish and Wildlife Service (USF&W). The USF&W will develop a recovery plan for the spotted owl. When the recovery plan is released, an amendment to the Forest Plan may be necessary to comply with that plan.

In compliance with the National Forest Management Act, the Forest Service is directed to "manage habitats for all existing native and desired non-native plants, fish, and wildlife species in order to maintain at least viable populations for such species". The Forest has selected various wildlife species as Management Indicator Species (MIS) to reflect the effects of Forest management on wildlife habitats and populations. The MIS identified on the Mt. Hood National Forest include:

- Spotted owls for old growth forest and mature forest habitat
- Pine marten and pileated woodpecker for high density snag mature and old growth habitat
- Deer and elk for hunting and other economic factors
- Merriam's turkey for pine/oak habitat
- Silver Gray Squirrel for pine/oak habitat
- Salmonids for aquatic habitat

The issue of maintaining viable populations of spotted owls and other MIS is closely associated with other public issues, such as roading, timber supply, riparian resources, and old growth. Increased roading may increase harassment of wildlife and may reduce their ability to make use of available habitat. Timber harvest has the greatest direct effect on habitat quality for many of the MIS. Riparian zones play key habitat roles for most of the MIS.

Indicators of Responsiveness

The following indicators of responsiveness to the Public Issue *Viable Populations of Spotted Owls and Management Indicator Species*, will be evaluated in each alternative:

- Population numbers or amount of suitable habitat protected for all Management Indicator Species (MIS).
- Potential habitat capability.

Wildlife populations are tied directly to the amount of available habitat, condition, and management of habitat. As habitat approaches optimum, the variety and numbers of wildlife change in keeping with the amount and types of habitat available. As habitat conditions deteriorate due to other management activities, wildlife population numbers and viability change. Acres of suitable habitat identified for management of MIS act as indicators of wildlife population conditions, particularly for deer and elk, mature and old growth associated species, and non-game species found in younger timber.

Changes Made From Draft to Final on the Issue of Viable Populations of Spotted Owls and Management Indicator Species

- Management direction for spotted owls is now based on the Final Supplemental Environmental Impact Statement (FSEIS) to the Pacific Northwest Regional Guide for spotted owls (December, 1988). That document determined that a viable population of spotted owls could be maintained through protection of 66 management areas of 1,500 acres each, dispersed throughout the Forest. The Forest's Draft EIS had established 85 management areas of 1,000 acres each.
- The Forest has identified and mapped all suitable spotted owl habitat. Identification of suitable habitat was based on the FSEIS definition, adapted to the Forest's habitat and vegetative conditions.
- In July 1990, the spotted owl was listed as a threatened species by the U.S. Fish and Wildlife Service.

Public Issue 5: Conflicts Between Management Activities and Competing Recreational Activities

Discussion of the Issue

A broad spectrum of recreational opportunities are provided by National Forests to meet the variety of recreation demands in the public. Many recreation opportunities are compatible with or dependent upon the management of other resources. For example, roads constructed for timber sales may provide access to dispersed recreation opportunities. On the other hand, some management activities are in direct conflict with recreational activities. For example, timber management and associated road building activities may preclude the provision of primitive unroaded recreational experiences.

The Mt. Hood's closeness to the Portland metropolitan area creates an additional demand for a wide variety of recreational opportunities to be provided. Several recreation and environmental groups have expressed concern that the amount of Forest land removed from the commercial timber base is insufficient. They believe that much more of the Forest land base needs to be placed in recreational, scenic, roadless, special interest, Wild and Scenic Rivers, and Wilderness classifications. They believe that the maintenance of these areas in a natural state is essential to the continuation of diverse recreation opportunities on the Forest. Wilderness is still an issue with these groups, and they have urged the designation of additional special interest areas.

Columbia Gorge Visitors Center

Timber interests feel that the Mt. Hood should be managed with a strong emphasis on timber production. They believe that enough land has been set aside for recreational purposes through the designation of Wilderness, special interest, recreation, unroaded, and scenic areas.

Another concern relating to this issue is the concern about logging on areas which have allocations that have a secondary goal of timber harvest yet require regulated harvest levels. This concern was centered primarily on the management of scenic viewsheds, although the same arguments can be made for all land allocations on areas with timber harvest as a secondary goal (all B land allocations). The concern is an expression of distrust in the Forest Service's ability, or resolve, to meet non-timber resource management objectives on areas that are used to calculate allowable sale quantity (ASQ). They feel the Forest will be driven to harvest timber in Category B land allocations to meet timber targets rather than emphasizing the other (non-timber) resource goals and objectives for the land allocations.

Conflicts between the various types of winter users are increasing. Ski groups and individuals do not favor the use of roads in winter snow zones by four wheel drive enthusiasts.

Indicators of Responsiveness

The following indicators of responsiveness to the Public Issue *Conflicts Between Management Activities and Competing Recreational Activities* will be evaluated in each alternative.

- Supply and Demand of Dispersed Recreation Opportunity Spectrum (ROS Classes) by Decade Expressed in RVDs (Recreation Visitor Days)

Changes Made From Draft to Final Regarding the Issue of Conflicts Between Management Activities and Competing Recreational Activities

- User information based on State of Oregon surveys has been added to the analysis process.
- Dispersed recreation demand projections were based on State of Oregon surveys and predictions.

Public Issue 6: Maintenance and Enhancement of Scenic Quality

Discussion of the Issue

As timber harvest and road construction activities occur, changes in the scenery become more apparent. The visual resource management issue revolves around the degree of protection that scenic values are given, and the costs and impacts of visual resource management on other activities.

Activities that alter the vegetation can change the character of the Forest's recreational setting. Many people find alteration of the natural setting objectionable, and feel that the Forest should be managed to retain all or most of the natural forest character. They believe that activities such as harvest units should be designed so that they do not dominate the view from any roads, trails, or sites used by recreationists. The public response to the Draft Forest Plan pointed out that there are other areas on the Forest (in addition to main travel routes) where visual quality should be a primary objective. These areas include the areas seen from Timberline Lodge, from Larch Mountain, and along several heavily used trails on the Forest.

The State of Oregon pointed out the tie between their tourism marketing campaign and the visual quality of the National Forests. This campaign relies heavily upon the scenic splendor of Oregon's national forests. Without a high quality view from high-use recreation sites and along the most traveled routes, the potential for tourism development is uncertain. The State also asked the Forest to consider uneven-aged management (a silvicultural technique used for timber management) for visual areas, as a way to decrease the conflicts between scenic quality and timber production.

On the other side of this question are those who feel that major portions of this Forest do not warrant a high level of visual protection due to the common character of the landscape and relatively low levels of recreation use. Their primary concerns are the reductions in annual timber harvest, and the associated costs of implementing visual management objectives.

The Forest has been inventoried according to the visual management system and stratified by potential Visual Quality Objectives (VQOs). The inventoried VQOs are used as a guideline for current management activities. The Forest Plan planning analysis considers the options of adopting these inventoried VQOs as standards for management on all or part of the Forest. The Forest has been stratified into 83 viewsheds of contiguous areas that are viewed from specific travelways or viewpoints, and would be logically managed to meet consistent objectives. These viewsheds vary in scenic qualities and type of use, and are prioritized accordingly (e.g., Timberline Lodge and Highway 26 viewsheds are considered high priorities).

The alternatives (discussed in Chapter II) include options for allocation of lands to meet inventoried VQOs, including Retention and Partial Retention, by viewshed. Viewsheds not allocated to meet inventoried VQOs would be managed at the next lower objective. In addition, management allocations that have no scheduled timber harvest would typically meet or exceed the inventoried objectives.

Indicators of Responsiveness

The following indicators of responsiveness to the Public Issue *Maintenance and Enhancement of Scenic Quality* will be evaluated in each alternative:

- The number of the Forest's 46 most sensitive viewsheds that will be naturally appearing after 50 years.

Visual quality is a public concern.

- The number of the Forest's 46 most sensitive viewsheds that will appear slightly altered after 50 years.

Changes Made From Draft to Final Regarding the Issue of Maintenance and Enhancement of Scenic Quality

The Forest has:

- Identified the areas seen from heavily used recreation sites and trails and inventoried these for potential inclusion in the B2 Scenic Viewshed land allocation.
- Developed management direction in Forestwide standards for trail foreground zones that are based on the visual sensitivity level inventory.
- Developed Forestwide standards which include target size trees, maximum area disturbed per decade, maximum area disturbed at any one time, and the size of created openings for each visual quality objective.
- Developed language allowing the use of uneven age management as a tool in viewsheds.

Public Issue 7: Disposition of the Remaining Roadless Areas

Discussion of the Issue

The Oregon Wilderness Act of 1984 left the Forest with approximately 130,000 Roadless Area acres in 10 different unroaded areas (see FEIS Appendix C for detailed descriptions of individual areas). The Act released these areas to be managed for uses other than Wilderness. In the DEIS Preferred Alternative, parts of the Eagle, Larch Mountain, Wind Creek, and Salmon-Huckleberry unroaded areas were included in the Unroaded Recreation allocation. In addition, parts of six areas were included in the Special Interest allocation which maintained semiprimitive recreation opportunities.

The issue is whether or not all of these remaining acres should be kept unroaded. If these areas remain unroaded, they could provide more natural fish and wildlife habitat, some old growth, and semiprimitive recreation opportunities. If these areas do not remain unroaded, they can be managed for other values including timber production.

Members of environmental groups have indicated their support for keeping the unroaded areas in a natural state. In their comment on the Draft Forest Plan, some felt that all 10 areas should be maintained, while others felt particular areas should be added to the preferred alternative. The most frequently named areas for retention as roadless were Twin Lakes, Larch Mountain and Wind Creek. They contend retention of these areas in an undisturbed state is essential to maintaining diversity of the Forest's ecosystems, enhancing habitat of sensitive plant and animal species, preservation of water quality, perpetuation of wildlife populations, and continuation of diverse recreation opportunities. Demand for semiprimitive recreation opportunities on the Mt. Hood currently exceeds supply, and this shortfall is projected to increase in the future (see FEIS Chapter II). Environmental groups see the remaining unroaded areas as a key to meeting the demand for semi-primitive recreation opportunities.

Those who would prefer that land and forest areas remain in their natural state, see options dwindling as new roads are constructed in previously undeveloped areas. Development has been deferred in these areas in recent years while various reviews have been conducted. It appears that major portions of these areas may be roaded in the next few years if the lands are allocated to uses that include timber management. Many feel that all or part of these lands should remain undeveloped, and should be managed to provide benefits that are not available in areas where timber harvest and roading are permitted.

Timber industry representatives, however, feel that these lands should be managed for timber production, because the Wilderness Act released them for multiple use management. In their comment on the Draft Forest Plan, they expressed the view that every opportunity to increase timber harvest levels by roading and harvesting in these remaining unroaded areas should be utilized. They believe that the timber in the roadless areas (which includes old-growth timber) should be harvested while it is still commercially valuable. They see the land base for timber production eroding away as additional areas are periodically designated for uses that preclude development for commodity production. Many feel that allocation of any additional land to uses that do not allow development would be unwarranted and unacceptable.

Indicators of Responsiveness

The following indicators of responsiveness to the Public Issue *Allocation of the Remaining Roadless Areas*, will be evaluated for each of the alternatives:

- The number and acreages of areas that are unroaded and unharvested after 15 years.
- The number and acreages of unroaded areas that are unroaded and unharvested after 50 years.

A number of unroaded areas remain unroaded after the first decade of management under each alternative. The number of areas are a measure of how the alternative responded to concerns about unroaded areas that were identified in RARE II (Roadless Area Review and Evaluation), as well as those remaining from the 1984 Oregon Wilderness Act. If an entire roadless area was protected by the land allocations in a particular alternative, the roadless area's acreage is included within the surrounding allocation. If most of an area was designated for activities that allowed roads or timber harvest, the roadless resource was assumed to be lost.

Changes Made From Draft to Final Regarding the Issue of Allocation of the Remaining Roadless Areas

- The sensitivity of the Roadless Areas have been re-evaluated.
- The Roadless Area acreage inventory has been updated (January 1990) to include data collected through September of 1988.

Public Issue 8: Diminishing Supply or Availability of Resources Traditionally Used in Native American Religious and Cultural Life

Discussion of the Issue

Native Americans (e.g. Confederated Tribes of the Warm Springs) who reside in the Mt. Hood area have a vital interest in how the Forest is managed. Native Americans have traditionally used lands that are now within the Mt. Hood National Forest for hunting, fishing, gathering plant resources, and religious ceremonies. These tribal groups have raised the issue of decreases in availability of the forest products that they have traditionally used in religious and cultural practices. These products range from anadromous fish and wildlife, such as salmon and elk, to a variety of plant resources, such as huckleberries, cedar and alder.

These groups have expressed a concern that years of land management to promote timber may have reduced the supply and accessibility of the resources they value. For example, huckleberries that are gathered by Native Americans may be reduced by Forest Service management activities. Practices such as fire suppression, conifer planting and natural regeneration tend to encourage tree growth in clearcuts and other openings. This causes huckleberries, which typically require sunny openings to thrive, to be crowded out by young trees.

Wildlife and anadromous fish are also resources which are used by Native Americans. Deer and elk, which are most successful in areas that offer a combination of forest cover and open forage, are a concern to these groups. Salmon, which require cool, clean water for habitat, are an extremely valuable resource to most local Native Americans. These groups have expressed a concern that the habitat and populations of deer, elk, and salmon may be affected by timber based resource management.

Native American's access to these traditional resources may be hindered by Forest Service land management practices. The American Indian Religious Freedom Act (Public Law 95-341, 1978) guarantees recognized Native American tribes access to Forest lands, for the practice of religious ceremonies and traditional rites. The remote locations of clearings can cause new huckleberry fields to be more difficult to reach. Access may be particularly difficult for older tribal members. Trails, roads and recreational development may also discourage access to areas that contain traditional resources. This is due to the increase in visitors, which may invite congestion and user conflict.

Indicators of Responsiveness

The Public Issue Diminishing Supply, or Availability, of Resources Traditionally Used in Native American Religious and Cultural Life does not have a "traditional", quantitative, indicator of responsiveness. The issue is addressed the same way in all alternatives. However, this issue will vary among the alternatives, as a result of the way the alternatives differ to address other issues.

- The relative quality of the supply and availability of traditional resources vary in response to the outputs of other resources, such as timber and wildlife (these are described for each alternative).
- Native American rights, privileges, and the continuing use of traditional resources have been recognized in the development of this Plan. Consultation with Indian Tribes, for program coordination and about specific projects, is part of on-going Forest management. Opportunities for enhancing specific traditional resources are considered during on-going project planning, in response to Forestwide Standards. This issue is addressed mainly through Forestwide Standards for Human Rights and Cultural Resources. See Forest Plan Chapter 4.

Changes Made From Draft to Final Regarding the Issue of Diminishing Supply or Availability of Resources Traditionally Used in Native American Religious and Cultural Life

- Forestwide Human Rights Standards have been updated to provide a better response to the expressed concerns.
- Several Resource Standards that relate to the management of fish and wildlife resources have been modified.

Public Issue 9: Maintenance and Rehabilitation of Fish Habitat and Water Quality

Discussion of the Issue

As evidenced by recent legislative initiatives, the demands for maintenance and rehabilitation of fish habitat and water quality have steadily increased in the last decade. In addition to State legislation, Federal legislation such as the Northwest Power Planning and Conservation Act (1980), increases protection of water from competing use. These competing uses include hydropower development, forest management activities, and agricultural practices.

Preservation of water quality is an important issue to many residents near the Forest, as well as many of those who use the Forest for recreation or irrigation. A very large number of people depend on water flowing from the Forest's watersheds.

This issue has arisen internally from concerns regarding the current condition of several of the Forest's watersheds, and externally from concerns raised by the Governor's Office, state and federal agencies, and environmental groups in response to the Draft Forest Plan. In their comments on the Draft Forest Plan, these groups asked the Forest to take action to lessen the impacts to watersheds that appear to be under stress. These groups expressed a concern that timber harvest often affects water quality (primarily from sedimentation), channel stability, water yield (peak flow during high magnitude events), mass wasting and other watershed characteristics. Where these results have occurred, it can be successfully argued that violations of the anti-degradation clause and section 319 of the Clean Water Act have taken place.

Many groups and individuals believe that the maintenance of anadromous fish habitat and the restoration of lost fish habitat should be high priorities of the Forest Service. Environmental groups are concerned that, even allowing for the current dams in place, the level of production of the Mt. Hood National Forest fishery for salmon and steelhead is substantially below potential. They believe that fish production targets for natural resident and anadromous fish should be established, and that habitat goals should be based on these targets. They feel that riparian areas need protection from timber harvest, road building and other intrusions in order to preserve wildlife values, protect stream bank stability, and ensure fish production.

Environmental groups have raised the issue that chemicals used in the management of Forest vegetation may enter streams, lakes, and other riparian areas, and adversely affect water quality and aquatic habitat. They are also concerned about restricted fish passage and the impacts on riparian areas from road building which results from timber harvesting in and near riparian areas.

Returning logs to streams can provide habitat for fish.

Timber industry groups believe that timber growing within riparian areas is an important part of the timber supply, they generally oppose heavily restricted timber harvest within riparian areas.

Indicators of Responsiveness

The following indicators of responsiveness to the Public Issue *Maintenance and Rehabilitation of Fish Habitat and Water Quality*, will be evaluated in each alternative:

- Aquatic Habitat Stability Index. The index is based on the Forest's capability to provide aquatic habitat for 10 to 20 years after Forest Plan Implementation. It is based on a scale of 1 to 10, with 10 as the highest rating. Aquatic habitats react to changing land conditions. The condition of the aquatic resource reflects the cumulative effects of a wide variety of management activities. As the condition of the aquatic habitat is changed, the numbers of species that survive also changes. The condition of aquatic habitats may be estimated from sediment indices, which are reflected as a habitat suitability rating.

- Acres explicitly managed to meet riparian objectives. These include the Bull Run Watershed, Key Site Riparian Areas, General Riparian Areas, and Special Emphasis Watersheds. The amount of land area specifically identified and allocated to the management of aquatic resources is also a good measure of overall aquatic habitat quality and the capability to maintain high quality conditions.

Changes Made From Draft to Final Regarding the Issue of Maintenance and Rehabilitation of Fish Habitat and Water Quality

- The Forest has developed a cumulative effects model that will, along with professional judgement, be used to generate the percentage of a watershed that can be impacted at any one time.
- The Forest has developed approximate "thresholds of concern," i.e. percentage of permissable watershed disturbance. The various values are applied to watersheds Forestwide, notably the Special Emphasis Watersheds, and are based on inherant physical watershed characteristics.

Public Issue 10: Supply of Developed Recreation Site Opportunities

Discussion of the Issue

The Mt. Hood National Forest is one of eleven recognized urban forests nationally. It serves as the "backyard" for many residents of the Portland metropolitan area and the Willamette Valley. According to the Oregon State Department of Parks and Recreation, the Forest is nearly the sole provider of specific types of recreational opportunities, and the major provider of many others.

This issue was raised in individual responses to the Draft Forest Plan. They expressed concern that the Forest is not increasing the number of developed sites at a rate which would accommodate a growing tourism trade. Several groups expressed a belief that our assumptions on recreation needs and growth were invalid. Commentors specifically disliked the fact that none of the Draft Forest Plan alternatives called for significant net changes in developed recreation. Many groups feel that the construction and reconstruction of additional campground facilities should be high on the Mt. Hood's list of priorities.

Indicators of Responsiveness

The following indicators of responsiveness to the Public Issue *Supply of Developed Recreation Site Opportunities*, will be evaluated in each alternative:

- Supply and demand of developed recreation opportunities by decade expressed in RVDs (Recreation Visitor Days).

Changes Made From Draft to Final Regarding the Issue of the Supply of Developed Recreation Site Opportunities

- The Forest has utilized the Oregon State Comprehensive Outdoor Recreation Plan (SCORP), and associated 1987 Northwest Demand Survey to analyze the demand for outdoor recreation opportunities on the Forest.
- The Forest has updated the existing inventory of all developed recreation facilities for theoretical capacity and Recreation Visitor Days (RVDs) per year.
- The Forest developed a Mt. Hood Recreation Strategy or "Vision Statement" using four major themes on the Forest. These themes are; 1) The Mt. Hood Loop - "A National Scenic Byway", 2) Clackamas River Drainage - "A National Wild & Scenic River Legacy", 3) East of Mt. Hood - "Ski, Hunt, Fish, Hike, and Bike", and 4) Winter Activities and Sports.

Using the "vision" developed above, SCORP, and the 1987 Northwest Demand Survey, the site and project opportunities were identified that were suitable for development of new, high quality recreation facilities. These include major rehabilitation and reconstruction projects. These projects will be considered in the development of the Forest developed site capital investment program, and in the project implementation schedule for the final plan (for more information see Chapter 5 of the Forest Plan).

Public Issue 11: Wild, Scenic, and Recreational Rivers

Discussion of the Issue

The 1988 Oregon Omnibus Wild and Scenic Rivers Act designated five rivers on the Mt. Hood National Forest. These rivers are the Clackamas River, White River, Roaring River, Salmon River, and Sandy River. The 1988 Omnibus Act required river boundaries to be established within one year of the Act's passage. It also requires management plans to be completed within three years of the Act's passage. The Forest is using 1/4 mile on each side of a river as the interim corridor boundaries, which will be re-evaluated and adjusted as necessary in development of management plans. A more detailed description of the Wild and Scenic River process can be found in Appendix E of the FEIS. The Mt. Hood National Forest and Columbia River Gorge National Scenic Area have jointly established a rivers planning team to develop river management plans, and to determine final corridor boundaries for rivers on both units.

The public comment by the Governor's Task Force, Oregon Rivers Council, Sierra Club, and other individuals expressed concern regarding the process used to recommend rivers for designation. In response, the Forest conducted an Eligibility study on 12 additional rivers. These rivers were specifically identified in the public comment process.

The eligibility process and evaluation criteria that was used for river selection was endorsed by the Oregon Department of Parks and Recreation and Oregon Rivers Council. Of the 12 rivers which were studied, all or parts of 11 rivers were found to be eligible. The West Fork Hood River was not found to be eligible. The rivers and river segments found to be eligible will be protected with the Wild and Scenic Rivers Standards and Guidelines, with the exception of the East Fork Hood River. Suitability studies will begin when the Forest Plan is completed.

As an eligible river, the East Fork Hood River had the potential to conflict with some of the proposed expansion activities at Mt. Hood Meadows. The Mt. Hood Meadows master planning effort had project implementation needs which required the completion of the Suitability Study for that river. For this reason, the Forest will complete it's study of the East Fork Hood as part of the Forest Planning process.

Indicators of Responsiveness

- Number of rivers studied for Wild, Scenic and Recreational River eligibility and/or suitability.
- Miles of river studied for Wild, Scenic and Recreational River eligibility and/or suitability.

Changes Made From Draft to Final Regarding the Issue of Wild, Scenic, and Recreational Rivers

- The 1988 Oregon Omnibus Wild and Scenic Rivers Act designated five rivers on the Mt. Hood National Forest as Wild, Scenic, or Recreational. These rivers are the Clackamas River, White River, Roaring River, Salmon River, and Sandy River.
- The Mt. Hood National Forest and Columbia River Gorge National Scenic Area have jointly established a rivers planning team. The goal of this team is to develop river management plans, and to determine the final corridor boundaries for the designated rivers on both units.
- The Forest conducted Eligibility studies on 12 additional rivers (see FEIS Appendix E). These rivers were specifically identified in the public comment process.
- The finding of eligibility for the East Fork Hood River had the potential to conflict with some of the proposed expansion activities at Mt. Hood Meadows. For this reason, the forest has completed the Wild and Scenic River suitability study for that river, within the Forest Planning process. The suitability decision will be contained in the Forest Plan Record of Decision.

Public Issue 12: Deer and Elk Management

Discussion of the Issue

The Department of Fish and Wildlife, environmental organizations, tribal groups, private citizens, and forest biologists feel that the DEIS preferred alternative did not adequately provide for the management of deer and elk species in timber emphasis areas. They believe that herd management objectives, cover forage ratios, forest wide road densities, and dispersion of harvest units were not adequately analyzed. The Forest has developed a new land allocations for deer and elk winter and summer range. The removal of land from timber emphasis to meet the needs of deer and elk will cause a reduction in the Forest's harvest level.

Indicators of Responsiveness

The following indicators of responsiveness to the Public Issue *Deer and Elk Management* will be evaluated in each alternative:

- Potential habitat capability.

Changes Made From Draft to Final Regarding the Issue of Deer and Elk Management

- The Forest has developed new land allocations for Deer and Elk winter and summer range.

Temporary forage is provided for deer in this harvested area

Chapter II

Alternatives Including the Proposed Action

CHANGES BETWEEN DRAFT AND FINAL

- Activity costs used in FORPLAN were reviewed and updated as necessary.
- State of Oregon recreation growth projections from the State Comprehensive Outdoor Recreation Program study were used.
- Direction contained in the spotted owl supplement to the Regional Guide is incorporated.
- Threatened and endangered species management direction was made site-specific.
- Alternatives B, D, and G were dropped from detailed consideration. Alternative Q was added.
- Dispersed Recreation demand projections from State of Oregon were utilized.
- Roadless Area acreage was updated.
- Several backcountry lakes were identified as management areas.
- Twelve rivers were studied to be included in the Wild and Scenic Rivers system. Five other rivers were designated as Wild and Scenic by Congress.
- The 1972 timber inventory was completely reevaluated in 1988.
- New even-aged and uneven-aged yield tables were developed.

Table of Contents

Chapter II - Alternatives Including the Proposed Action

Introduction

This chapter is the heart of the Final Environmental Impact Statement (FEIS). It presents alternative ways to manage the Forest along with comparisons of each alternative's resource outputs and effects.

This chapter is organized into three sections:

- A summary of the analysis conducted while developing the alternatives.
- A description of each alternative. This includes a description of the objective, management emphasis, and consequences of each alternative.
- A comparison of the alternatives. This section presents the more significant outputs, effects, economics, and tradeoffs of each alternative considered in detail. Each alternative produces different combinations of resource outputs. This results in different effects on the Forest and the neighboring area. These effects or impacts are measured relative to various costs, benefits, and tradeoffs.

References are made in this chapter to other parts of this document:

- Chapter I describes the issues which guided the formation of the alternatives.
- Chapter III describes the environment affected by the proposed alternative ways of managing the Forest.
- Chapter IV addresses the environmental consequences of the eight alternatives developed in this chapter.
- Appendices to this FEIS describe various procedures and findings in greater detail.

The Final Forest Plan is a companion document to this FEIS and details the particular standards and activity schedules which are the operational part of the preferred alternative.

The eight alternatives presented in this FEIS differ from each other in a number of ways. Some of the most important differences relate to the level, mix, and location of outputs, services, and environmental effects. Most of these differ for each alternative because each alternative reflects different ways of responding to the issues.

Alternative Development and Analysis

Introduction to Alternatives

Alternatives display different ways of managing lands and resources of the Mt. Hood National Forest. Each alternative is a unique combination of land uses, management guidance and practices, and activity schedules for different parts of the Forest. As a result, each alternative would generate a different mix of goods and services for the public, and a different combination of resource outputs and environmental effects.

A set of alternatives covering a broad range of possible actions was formulated by the interdisciplinary team. In formulating these alternatives the Interdisciplinary Team was guided by several considerations:

- Alternatives must explore a variety of ways to respond to the public issues, management concerns, and resource use and development opportunities identified by the planning process.
- Planning regulations 36 CFR 219.12(e) and (f) require use of an analytical process to determine minimum and maximum resource production levels and economic consequences. In addition, alternatives must respond to management concerns, and include alternatives which reflect current Forest and National programs, such as that for the Forest and Rangeland Renewable Resources Planning Act of 1974 (RPA).

In some alternatives the Forest would manage for production of commodities such as timber, while other alternatives would emphasize amenities, such as dispersed recreation and nongame wildlife habitat. One alternative (Alternative A, the "No-Action" Alternative) reflects current management direction, while another (Alternative C) reflects objectives of the Forest Service RPA program. From this range of alternatives, the Regional Forester had a basis for recommending the one which has the greatest net public benefit.

Net public benefit is the value to the nation of all benefits less all associated costs. This includes both priced and nonpriced benefits. Priced benefits (i.e. those received from timber, commercial fishing, and developed recreation) can be given dollar values determined by either actual market transactions or by estimation methods that produce prices approximating market transactions. Nonpriced benefits (i.e. scenic views, threatened and endangered species, natural and scientific areas, historical and archeological sites, and clean air and water) are among those for which there are no available market transaction data and no reasonable way to estimate a dollar value similar to market values associated with priced benefits. The preferred alternative is believed to provide the largest benefit above the cost of providing those priced and nonpriced benefits. For a further discussion of net public benefit and priced and nonpriced benefits see Appendix B.

"Benchmarks" are presented and discussed several times in this chapter. Benchmarks are analytic bases from which the alternatives were developed. One major purpose of benchmarks was to determine the maximum amount of various resource outputs the Forest can produce, subject to legal requirements. They were also used to provide information on the maximum biological potential of the Forest and economic implications of management. Character and use of benchmarks will be discussed later in this chapter.

The primary purpose of alternative development is to provide an adequate basis for identifying the alternative with the greatest net public benefit (219.11 (f)). Alternatives are based upon resource capabilities of the Forest. Each alternative is designed to manage the Forest to achieve some goals and objectives. Some objectives, such as providing a sustained timber yield, are common to all alternatives. Others, such as timber harvest levels and degree of fish habitat protection above management requirement levels, vary widely among alternatives.

By managing the Forest resources in different ways, various objectives can be achieved to respond to the many issues and concerns on the Forest. Management can vary by what is done, where it is done, and when it is done. The result is a combination of management activities, management areas, and schedules which define a unique combination of resource outputs and environmental conditions for each alternative

The alternative development process used here is outlined in 36 CFR 219.12. These regulations include the following goals for alternative formulation:

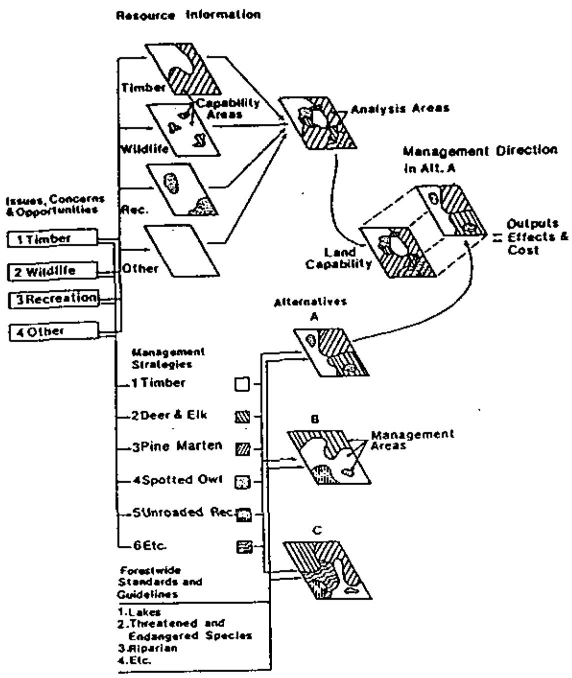
- Provide the basis for identifying the alternative that maximizes net public benefit;
- Distribute alternatives between minimum and maximum resource potentials and reflect a range of environmental resource uses and expenditure levels;
- Facilitate analysis of opportunity costs and tradeoffs;
- Evaluate effects on present net value, benefits, and costs;
- Provide different ways to respond to major public issues, and
- Meet objectives of the alternative in a cost efficient manner.

To determine responsiveness of a proposed management alternative to public issues, it is important to understand relationships between potential supply and projected demand for each forest resource. Information on general trends in demand is included in "Timber," "Fish," "Wildlife," and "Recreation" in FEIS, Chapter III and can be compared with demand projections presented in the tables in "Development and Use of Benchmarks" in this chapter. More information on supply and demand is also included in that section and in Forest Plan, Chapter 2.

Overview of Alternative Development Process

Figure II-1 illustrates the steps and linkages used to develop alternatives and determine their outputs and effects.

Figure II-1 Alternative Development Process



Step One of the process was to identify Issues, Concerns, and Opportunities (ICOs). A complete discussion of the ICOs is found in Chapter I and in Appendix A. The ICOs were used to determine what resource information and other data were needed to resolve them. To deal with all aspects of the ICOs, the resource's response to various activities had to be determined as well as its productive potential.

Step Two involved the collection of resource information and the development of a number of resource maps. Most of the data was primarily collected or developed from existing resource inventories, such as the Forest's TRI (Total Resource Inventory) data base. Chapter III describes these resources in detail; maps are provided for some of the resources.

Step Three combined resource information such as major drainages, vegetation, site production, etc. onto a single overlay and like characteristics were aggregated into groups called analysis areas. Analysis areas are tracts of land assumed to be homogeneous in terms of outputs and effects.

Analysis areas serve as the basic unit of land in the planning model. The delineation criteria used to identify analysis areas were intended to capture the output variations when different management activities are applied. Over 350 analysis areas were identified on the Mt. Hood National Forest based on the following delineation criteria:

- Major Drainage
- Timber Working Group
- Timber Site Productivity Class
- Vegetation Age and Condition

Appendix B provides detailed information on the development and use of analysis areas.

Step Four developed management direction that could be applied to the ground in various combinations to resolve the ICOs. This management direction is in two broad forms: Forestwide standards and guidelines and management strategies.

Forestwide standards and guidelines are used to mitigate various activities that can occur almost anywhere on the Forest. For example:

- Direction to conduct a cultural resource inventory prior to any ground-disturbing activity will apply at any location on the Forest where such activities are proposed.
- Direction requiring unnecessary local roads to be obliterated will apply to any local road on the Forest.
- Prohibited use of aerial fire retardant in a riparian zone applies to all riparian areas on the Forest.

Management strategies, on the other hand, apply to specific areas of the Forest to meet different objectives. Forty-five management strategies were developed in this FEIS and Plan. These management strategies consist of a goal and a desired future condition. They also contain direction, standards, and guidelines on how to implement activities to achieve the goal. Multiple-use objectives are associated with each management strategy.

Chapter 4 of the Forest Plan and Appendix D of the FEIS provide a complete set of Forestwide standards and guidelines and management strategies.

In *Step Five*, the alternatives were formulated. An alternative is one approach to managing the land and resources of the Mt. Hood National Forest. Eight alternatives were developed and thoroughly evaluated in the FEIS. Each employs a different array of management strategies to achieve its goal. The goal for Alternative C, for example, is to emphasize marketable resources. It was met by applying the Timber Emphasis Management Strategy to a large portion of the Forest. By assigning different mixes of strategies to various portions of the Forest, a unique combination of resource outputs and environmental conditions is produced.

By varying the assignment of management strategies to analysis areas, a wide range of alternatives could be assessed. For each alternative, the management strategies were assigned to land area based on the theme and goal for that alternative and the ability of the area to provide outputs that were emphasized. This tie to the land allowed outputs, costs, and effects of different management activities to be estimated for different land characteristics.

When a management strategy is actually applied to a piece of ground, it limits the potential set of management prescriptions to those that are compatible with the strategy. A prescription is a schedule of management activities and resulting outputs under a specified investment level and timing. The Forest developed prescriptions to address a variety of timing choices with different management activities and intensities.

An area of land that a management strategy is assigned to is called a management area. Management areas may or may not be contiguous.

In *Step Six*, alternative designs were entered into the Forest planning model (FORPLAN). FORPLAN is a linear programming computer model. Given the assignment of strategies to the land, the FORPLAN model selected the best set of management prescriptions to meet the overall alternative goals and objectives.

The final choice of management prescriptions established a specific schedule of uses and outputs. Along with the outputs, management costs and environmental effects were also determined.

Appendix B describes the entire analysis process in detail. You are encouraged to refer to that appendix for a more complete discussion of the planning process.

Public Issues

An important part of planning is determining how the public wants the Mt. Hood National Forest to be managed. The ID team went to the public to ask what was important to them. This process is documented in Chapter I and Appendix A of the FEIS. Based on this input, the ID team developed a list of 12 public issues:

- Timber Supply
- Communities
- Old Growth
- Spotted Owls and Management Indicator Species
- Recreation Use Conflicts
- Scenic Quality
- Roadless Areas
- Resources Used by Native Americans
- Fish Habitat and Water Quality
- Developed Recreation
- Wild and Scenic Rivers
- Deer and Elk Management

These issues formed the base for forming the alternatives. Under the description of each alternative, we show how that alternative responds to each issue.

Description of the Analysis Process

The first step in the analysis began with the inventory of the Forest and construction of a data base which portrays the land and resource characteristics of the Forest land base. Using a geographical information system (MOSS) areas with similar attributes were aggregated into over 350 analysis areas. Analysis areas are the basic units used in the analysis process and are not necessarily contiguous. Analysis areas are distinguished by differences in response to management practices, benefits, and costs.

A review of the ICOs by the ID Team resulted in a number of broad themes, or tentative management strategies, that might be used in formulating a range of alternative ways to respond to each ICO. Initially, a team was assigned the task of writing a goal statement, desired future condition, and set of specific standards and guidelines, or management direction for each of the strategies.

For each strategy, the teams formulated standards and guidelines addressing the full range of resource values, such as recreation, wildlife, and timber, as well as facilities such as roads and trails. The standards and guidelines in most strategies include several management options, or intensities, that can be different levels. Varying the combinations of intensities, as well as the areas assigned each strategy, ensures that the range of alternatives fully responds to each ICO.

In conjunction with the creation of analysis areas, the ID Team formulated management prescriptions; sets of activities which represent a specific method of managing

particular analysis areas. A group of these prescriptions covers the various ways that the different analysis areas can be managed. These prescriptions provide the choices which can be made in managing the land. An estimate of the economic costs and resource yields associated with the prescriptions was generated for use in the forest planning model, FORPLAN. See Appendix B for details of the costs and benefits used in the analysis.
FORPLAN, a linear programming model, was used to analyze many of the management objectives and how they interact. In FORPLAN, the objectives of the alternatives were represented as constraints, and the possible activities were represented as prescriptions. The FORPLAN model then found the most efficient set of prescriptions which met some overlying objective, subject to the constraints of the alternative. The overlying objective of the alternatives discussed in this FEIS is to maximize timber in an economically efficient manner in all alternatives except NC.

Present net value of timber prescriptions on a per-acre basis (Stage II Analysis) was determined for each prescription and timing choice. Present net values ranged from $10,100 per acre to -$68 per acre.

FEIS Appendix B describes the entire analysis process and all changes made between the DEIS and FEIS. Refer to Appendix B for a more complete and technical discussion.

Data Collection and Analysis Areas

There are several types of data which are used to develop and analyze alternatives. In order to calculate resource potentials, the Forest has inventoried many resources, including vegetation, wildlife species, mineral resources, and viewsheds.

The basic data regarding the size, growth, and yield of commercial timber species were gathered during the vegetative inventory which was completed in 1986.

This data was combined, using a database management system, into a set of unique analysis areas. These areas represent unique combinations of conditions in the Forest. Examples of the characteristics used to separate analysis areas are drainage, slope, timber type, and site productivity. These analysis areas were analyzed in a linear programming model called FORPLAN. The analysis areas and the FORPLAN model were used to derive optimum timber harvest schedules. The FORPLAN analysis process is discussed in more detail in Appendix B.

Many other resource inventories were used in the alternative formulation process. Among these were visual quality, unroaded management opportunities, fish habitat and water quality, wildlife habitat relationships, and opportunities to provide for research or other special needs. These were assessed by the ID team outside the FORPLAN model and used in defining the management areas that were needed to provide a range of responses to the public issues.

In conjunction with creation of analysis areas, the ID team generated "management prescriptions" - sets of activities which represent a specific method of managing particular analysis areas. A group of these prescriptions covers the various ways that different analysis areas can be managed. These prescriptions provide choices which can be made in managing the land. An estimate of economic costs and resource yields associated with the prescriptions was generated for use in the forest planning model, FORPLAN. Costs were revised between draft and final EIS to reflect current operating procedures. (See Appendix B for details of the costs used in the analysis.) FORPLAN was used to analyze many management objectives and how they interact. In FORPLAN, objectives of alternatives were represented as constraints, and possible activities were represented as prescriptions. The FORPLAN model then found the most efficient set of prescriptions which met some overlying objective, subject to constraints of the alternative The overlying objective of alternatives discussed in this FEIS, except Alternative NC, is to maximize present net value (PNV). Alternative NC was not developed using FORPLAN.

PNV of timber prescriptions on a per-acre basis (Stage-II Analysis) was determined prior to development of alternatives in the DEIS, and then revised to reflect changes in timber inventory information between draft and final EIS. See Appendix B "Financial Analysis of Lands Tentatively Suitable for Timber Production" for more information on Stage-II Analysis.

The data base was updated between draft and final EIS to reflect growth to the midpoint of the first decade of the Plan. The data base was also revised to reflect the spotted owl network developed to meet direction in the spotted owl supplement to the Pacific Northwest Regional Guide.

The analysis process used for Alternative NC was much different than that used for other alternatives. The Timber Management Plan (TM Plan) was developed between 1976 and 1979 and forms the basis for Alternative NC. The interdisciplinary team used documentation in Forest files and the TM Plan EIS as sources for much of the information displayed about Alternative NC.

The FORPLAN analysis model was not used for Alternative NC. FORPLAN could not be used because of how original data for the TM Plan was organized and because of the way land was characterized in the TM Plan data base. As a result, several projections made for the other alternatives from results of the FORPLAN model could not be made for Alternative NC. Instead, the interdisciplinary team made qualitative estimates of some environmental effects.

FEIS, Appendix B describes the entire analysis process and all changes made between draft and final EIS, including models used in the process. Refer to Appendix B for a more complete and technical discussion.

Management Requirements

The Forest Plan must meet a number of legal requirements. These legal requirements are identified broadly in section 219.27 of NFMA Regulations, which deals with resource protection. The Chief of the Forest Service directed all Forest Plans to comply with Management Requirements (MRs) to ensure that Forest planning fully reflects the requirements of law and regulations.

Mangement Requirements are provisions for both the short- and long-term protection of natural resources. Included in MRs, for example, are actions to ensure long-term viability and diversity of plant and animal populations, conservation of soil and water resources, and maintenance of water quality, as well as various silvicultural practices. Many of the MRs have resulted in Forestwide standards and guidelines or management strategies.

As a result of the regulations and the nature of the provisions, MRs become part of the alternative development process. While MRs were designed to ensure that Forest planning complied with legal requirements, they were not established to set a ceiling of management. Instead, MRs set a "floor", identifying the level below which management will not normally be considered. MRs are not an end in themselves but are one step in the process of defining a selected level of management.

Interpretations and standards for meeting MRs evolved from different levels within the Forest Service. At the national level, policies on timber harvest flow requirements, harvesting at culmination of mean annual increment (CMAI), identifying lands suitable for timber production, etc. were developed. To assist Forests in the Pacific Northwest Region (Region 6), the Regional Office in Portland, Oregon prepared further direction for implementing Mangement Requirements dealing basically with wildlife, dispersion of created openings, water quality, and riparian areas. In February 1983, a Regional Office memorandum was issued to provide guidelines for incorporating MRs. These regional MRs were developed by resource specialists with the involvement of the Forests. The regional MR direction has been reevaluated several times, with the last evaluation resulting in a report called *A Background Document on the Development and Review of Management Requirements for Forest Planning on the National Forests of the Pacific Northwest Region* (USDA Forest Service, June 1986). It is expected that consistent with the dynamic nature of Forest planning, other revisions will occur in the future.

Spotted owl, with mouse.

In the development of benchmarks and alternatives, except the No Change Alternative, each Forest was directed to use management requirements. The Forest Interdisciplinary Team assessed national and Regional direction for the MRs as they pertained to the Mt. Hood National Forest. Many of the requirements had little impact on other resource values and could be met with standards and guidelines that direct project implementation (see Appendix D). Mangement requirements that did impact other resources included timber dispersion, riparian management, and maintaining viable population levels for pine marten, pileated woodpeckers, spotted owls, and cavity excavators. Following is a discussion of the Management Requirements with substantive standards that affect resource outputs.

Harvest Dispersion: The Regional Guide states that no clearcut harvest unit openings may exceed 60 acres in the Douglas-fir type and 40 acres in all other forest types. Logical unharvested areas also must be left between these openings. The unharvested areas may not be harvested until the previous openings are adequately stocked with trees 4.5 feet tall. On the Mt. Hood National Forest, this condition is usually achieved within 10 to 20 years after final harvest. A harvest dispersion constraint in the FORPLAN model limited regeneration harvesting to not more than 25 percent of the suitable timber land base. Refer to Appendix B for more detail concerning the modeling of harvest dispersion.

Riparian Area: The NFMA Regulations state that *"special attention shall be given to land and vegetation for approximately 100 feet from the edges of all perennial streams, lakes, and other bodies of water. No management practices causing detrimental changes in water temperature or chemical composition, blockages of water courses, or deposits of sediment shall be permitted within these areas which seriously and adversely affect water conditions or fish habitat."* (36 CFR 219.27(e))

The protection of riparian values and water quality was achieved through land allocations and timber harvest constraints. This included the allocation of approximately 12,600 acres of selected fish habitat and water quality areas having unique characteristics or benefits. For those areas, management of riparian-dependent resources is emphasized and regulated timber harvesting is prohibited.

Timber harvesting is restricted on the other riparian areas. The FORPLAN model was constrained to harvest only 20 percent of the riparian area, using the same rotations as the adjacent stands. The other 80 percent of the riparian area was placed in a no harvest prescription. Modeling riparian this way allows some flexibility in the actual management since there are a number of ways to produce the required volume. These include:

- removing all the timber from 20 percent of the acres;
- removing 20 percent of the volume from all of the acres;
- or employing some mix that yields 20 percent of the volume.

The intent of these constraints was to promote conditions that provide shade for water temperature quality and a source of future large woody debris for fish habitat.

Spotted Owl: The northern spotted owl is generally found within habitats containing old-growth conditions at low elevations in the Douglas-fir region. The Forest, according to the *Amendment to the Pacific Northwest Regional Guide-Spotted Owl Habitat Management* (December 8, 1988), has to have at least 66 areas for owls dispersed throughout the Forest in a network system. Each area consists of mature and old growth types of habitat suitable for spotted owl habitat.

Guidance concerning habitat for spotted owls is taken from the *Final Supplement to the Environmental Impact Statement for an Amendment to the Pacific Northwest Regional Guide, Spotted Owl Guidelines*, USDA, 1988. See the Wildlife section later in this chapter for details.

Pine Marten and Pileated Woodpeckers: Pine marten and pileated woodpeckers are representative of wildlife species which occupy mature and old growth habitat types. These species are similar in their habitat requirements except that the pileated woodpecker requires a suitable habitat of about 300 acres and the marten requires about 160 acres. These habitat requirements are based on Regional direction which specifies vegetative characteristics and distribution of habitat areas. To meet Management Requirements, habitat areas for 96 pileated woodpecker pairs and 231 female marten were established on the Forest.

Given the distribution of the marten and pileated woodpeckers, it was determined that many of the required habitats could be located within Wildernesses and other withdrawn areas. Habitat areas for these species were also located within the spotted owl habitat areas (SOHAs). Additionally, pileated woodpecker habitat represented habitat required for the marten. Since the species are compatible on the same range, locating and combining habitats in this manner reduced the impacts on other resource activities.

Cavity Excavators: There are between 50 and 70 species of birds on this Forest whose habitat contains standing dead trees (snags). Suitable habitat is maintained in harvest areas when 7 to 10 trees per acre with diameters ranging from 11.5" dbh to 18" dbh are left standing. The management requirement would maintain this level of snags and green tree replacement in harvest units.

The MRs are based on the available scientific research, supplemented by experience and professional judgement. MRs are designed to provide those minimum levels of resource protection required while minimizing the adverse impacts to other values. As knowledge of these resources builds and additional research findings come to light, the Forest Service is prepared to modify management direction, including the MRs, to stay current with the state-of-the-art in forest resource management. This information presented in this section, along with the referenced appendices and other documents, is intended to provide information that may be useful in reviewing the MRs, commenting on their adequacy, suggesting refinements or modifications, or suggesting alternative methods of meeting the requirements that may give a better balance of resource benefits.

See Appendix F, FEIS, for a detailed discussion of the MRs and the analysis of various methods or ways to meet MRs.

Development and Use of Benchmarks

The major purpose of benchmarks was to determine the maximum physical capability of the Forest to produce various resource outputs related to the public issues. Collectively, the benchmarks defined the range within which alternatives could be constructed (also known as "decision space"). They were also used to provide information on maximum biological potential for the Forest and the economic implications of various management strategies.

Eight benchmark levels were developed to define resource supply potentials and economic relationships on the Forest. Production capabilities were determined for a minimum level of management, for maximum output (or condition) of single resources, and for a set of multiple resource outputs that maximize present net value (NFMA regulation 219.12e). A level was also established from which the costs and effects of applying regulation and policy constraints were measured. The computer model FORPLAN was used to help determine the resource supply potentials. All benchmarks except the Current Direction Benchmark include the MRs.

Benchmark descriptions are summarized in this section. A detailed discussion and the results of the benchmarks may be found in Appendix B. Table II-1 outlines the decision space for some of the major indicators analyzed in the benchmark analysis, and shows existing condition and estimated demand for each of these. Demand estimates are explained in the following section.

Current Direction Benchmark

This benchmark defined the level of goods and services that the Forest could produce if current management direction is followed with no budget constraint. Given information from the benchmarks discussed above, the results of this benchmark served as the basis for determining the need to change management direction.

Minimum Level Benchmark

This benchmark defined the minimum costs of public landownership and the resource outputs which are incidental to Forest management. This benchmark served as a reference point to develop and/or test alternative outputs and costs which result from Forest Service management activities. This benchmark is displayed in order to provide a reference to the minimum level considered when a comparison of alternatives is made.

Maximum Present Net Value (PNV) Benchmark

This benchmark established the mix of resource uses and outputs that results in the greatest difference between total discounted costs and total discounted benefits over the planning horizon using market and assigned nonmarket values. This benchmark provides the reference point for determining economic opportunity costs in other benchmarks and alternatives.

Maximum Timber Benchmark

The maximum capability of the Forest to produce timber in a manner consistent with the Management Requirements (36 CFR 219.27) was determined by this benchmark. Timber production was maximized in the first decade, then "rolled over" under a "Max PNV" objective function to achieve the timber objective in a cost efficient manner. The physical capabilities of the Forest to satisfy the timber supply issue was determined through this benchmark.

Departure Benchmark

This benchmark estimates the most efficient management for the Forest when timber harvest scheduling is not based on nondeclining flow.

Recreation Benchmark

This benchmark estimates capability of the Forest to provide a mixture of recreational opportunities, including semi-primitive nonmotorized (SPNM), semi-primitive motorized (SPM), roaded natural, and developed. Unlike other benchmarks, it does not represent potential to produce the maximum of each individual type of opportunity, because the various types of recreation are mutually exclusive (e.g. SPNM and SPM). Instead, this benchmark provides a mixture of uses.

Nongame Wildlife Benchmark

This benchmark estimates capability of the Forest to provide habitat for nongame species of wildlife. Habitat is provided for these species at levels well above MRs, but not at each species' highest potential level. Like the recreation benchmark, it was designed to balance needs of all species.

Maximum Fish/Watershed Benchmark

The purpose of this benchmark was to establish the highest reasonable level of anadromous fisheries outputs. Management activities designed to improve overall watershed conditions were included in this benchmark. The Forest's ability to satisfy the fish habitat and water quality issue was determined in this benchmark (although strategies for additional capital investment opportunities were identified and included in some alternatives).

Demand Analysis

Demand estimates in Table II-1 reflect future output/effect levels anticipated by several public agencies, including the Forest Service. These projections are discussed several places in the EIS, including Chapters III and IV, and are summarized below.

Timber

Demand for timber reflects the amount needed from the Forest in the future. The RPA timber harvest objective of 80 MMCF/year was developed for the 1980 RPA program and distributed to the Forest in the Regional Guide (USDA Forest Service 1984a). This objective was based on existing management plans and direction and other available information used to develop the RPA program in the late 1970s It reflects the Nation's resource management priorities as determined in 1980 by Congress and the administration, with extensive public participation.

Demand projections were not made specifically for hardwoods. In general, demand for hardwood volume fluctuates with demand for lumber and wood products. In 1980, annual hardwood production in Oregon was estimated to be 20 MMCF of which 50% was assumed to be for lumber and the rest for veneer logs, pulpwood, and firewood (Oregon Department of Forestry 1980). Statewide and nationally, it appears that there is an adequate supply of hardwood timber. It is assumed that future demand for hardwoods on the Forest will steadily increase above past harvest levels of 6 to 18 MMBF/year as markets develop further.

Watershed

Demand was not projected specifically for either water quantity or quantity. However, it is assumed that demand for both will increase as more people move into areas adjacent to the Forest resulting in increased municipal, industrial, agricultural, and recreational uses of water.

Fish and Wildlife Habitat

Objectives developed by the Oregon Department of Fish and Wildlife reflect goals to maximize amounts of habitat available for fish and wildlife, especially game species. Objectives displayed in Table II-1 as well as objectives for nongame species are discussed in more detail in FEIS, Chapter IV "Consistency with Plans or Programs of Other Agencies".

Recreation

Future recreational use (including recreation associated with wildlife and fish habitat, and displayed in Table II-1) was estimated for most types of recreation based on growth rates developed for the State Comprehensive Outdoor Recreation Plan (Division of State Parks and Recreation 1989). In general, growth rates reflect anticipated population growth, changes in rates that people participate in different types of recreation, and characteristics of different recreational sites. These demand estimates were also used to project how well alternatives responded to issues concerning Special Interest Areas (SIAs), development in Wildernesses, and undeveloped areas.

Visual Resources

Demand for protection for scenery was based on an inventory of environmental characteristics of the Forest, as well as characteristics of people who use the Forest and adjacent travel corridors.

Research Natural Areas

Demand was not specifically projected for Research Natural Areas. However, it is assumed that demand will continue at current levels or increase as fewer areas are left in an undeveloped state.

Range of Alternatives

The benchmarks presented in the previous section were used to develop alternatives that represent a range of resource outputs for addressing and responding to public issues. Upper and lower production levels for these outputs also established the range of possible options available to the decision maker for resolving the issues. For example, the timber and minimum level benchmarks show that timber allowable sale quantity can range from a minimum of zero to a maximum of 49 million cubic feet (MMCF) per year in the first decade when timber policy constraints apply. Thus, without relaxing the timber policy constraints, the most the Forest can do to satisfy the timber supply issue is produce an average of 49 MMCF of timber per year.

The degree of flexibility that the decision maker has in responding to the public issues is referred to as "decision space". In most cases, benchmarks were not carried forward as alternatives because they were responsive to only one of several resource issues. Alternatives were designed to span the benchmark range while meeting policy constraints such as riparian protection, MRs for viable wildlife populations and other multiple-resource objectives.

This FEIS presents eight alternative ways to manage the natural resources of the Forest. Each addresses public issues and management concerns in different ways. Taken as a group, the alternatives provide a wide range of outputs and produce a corresponding range of environmental impacts. Efforts were made to include a variety of options for the management of each resource or area in the different alternatives. These alternatives use the best available data regarding the suitability of land for harvesting timber, timber utilization standards, and analytical techniques. Timber harvest levels are determined using the FORPLAN model. These alternatives assume that the MRs are incorporated into the current direction.

The major changes made between draft and final EIS are Alternatives B, D and G were dropped from consideration. After looking at the range of outputs of all the alternatives, it appeared that these alternatives were similar enough to other alternatives that they did not need to be analyzed in detail.

Also, the preferred alternative from the draft EIS was modified in response to public comment. The modifications were significant enough that a new preferred alternative, alternative Q, was formed by the ID team. The preferred alternative from the draft EIS is still shown as alternative E.

The range of alternatives possible and their development was limited by the need to meet other resource objectives. All alternatives except NC comply with the following:

- The Regional FEIS on managing competing and unwanted vegetation, which allows the use of all management tools while reducing reliance on herbicides. This constraint was added between draft and final EIS;
- The standards and guidelines from the Regional Guide and supplemental EIS, which at least meet the MR level and assure viability of the spotted owl, have been incorporated into all alternatives except NC. This goal was also added between draft and final EIS; and
- Other MRs discussed in the Management Requirements section of this chapter and in Appendix F.

Required Alternatives

Some of the alternatives considered by the Forest are required by regulations or policies. These are listed briefly here and described in detail in the remainder of this chapter.

Current Direction (No Action)

This alternative meets the requirement of 40 CFR 1502.14 (CEQ Regulations). This specifies that at least one alternative reflect the most likely condition of the Forest in the future if current management practices and policies are not changed. Therefore, this alternative includes the goods and services, costs and benefits, and the environmental effects of current management projected into the future. This alternative, presented as management direction provided by existing plans, is identified as Alternative A.

This alternative uses the best available data regarding the suitability of land for harvesting timber, timber utilization standards, and analytical techniques. Timber harvest levels are determined using the FORPLAN model. This alternative assumes that the management requirements (MRs) will be incorporated into the current direction.

Table II-1 Decision Space and Demand Projections for Issues Indicators

Output/Effect	Unit of Measure	Existing Condition	Demand Projection by Year 2050	Highest Level[3]	Lowest Level[3]
Timber					
Long-Term Sustained Yield Capacity	MMCF/yr	38.9[1]	NE	51.6	18.1
Allowable Sale Quantity	MMCF/yr	38.9[1]	[2]		
1st Decade				51.6	18.1
2nd Decade				51.6	18.1
5th Decade				51.6	18.1
Timber Sale Program Quantity	MMCF/yr	44.3[1]	NE	60.1	20.6
Land Managed for Timber Production	MAcres	435[1]	NA	568	217
Old Growth	MAcres	345.3[1]	NA		
1st Decade				330.2	302.1
2nd Decade				318.5	261.1
5th Decade				290.1	185.6
Old Growth Potential Including Ingrowth	MAcres	345.3[1]	NA		
1st Decade				330.2	302.1
2nd Decade				392.5	335.5
5th Decade				523.3	400.8
Water Quality					
Sediment Index	Tons/decade	318,135[1]	NA		
1st Decade				374,727	247,527
2nd Decade				374,920	241,039
5th Decade				394,658	260,227
Fish Habitat					
Smolt Habitat Index, Decades 1-5	M Smolts	653.6	NE	2,350	0

[1] *These numbers reflect the condition described by Alternative A. Does not apply to 1st, 2nd, and 5th decades.*

[2] *1980 RPA Target was 376 MMBF.*

[3] *These numbers are the result of the analysis of Alternatives. See Table II-27, Quantitative Outputs and Effects by Alternative for more details.*

NE = Not Estimated

NA = Not Applicable

Table II-1 Decision Space and Demand Projections for Issues Indicators (continued)

Output/Effect	Unit of Measure	Existing Condition	Demand Projection	Highest Level	Lowest Level
Wildlife Habitat					
Spotted Owl Habitat Areas	# SOHAs	66[1]	NA	72	0
Spotted Owl Habitat Capability, Decades 1-5	# Pairs	180	NA	194	124
Peregrine Falcon Nesting Sites	# Sites	3	NA	7	3
Bald Eagle Habitat Managed Habitat Sites	# Sites	26	NA		
1st Decade				26	0
5th Decade				26	0
Recreation Use					
Rural	MRVDs/yr	457	11,016	1,075	793
Roaded Modified	MRVDs/yr	6,825	3,372	6,376	251
Roaded Natural	MRVDs/yr	1,810	4,946	7,450	2,119
Semiprimitive Motorized	MRVDs/yr	19	674	38	2
Semiprimitive Nonmotorized	MRVDs/yr	406	1,349	333	108
Total Recreational Use	MRVDs/yr	12,517	21,357	15,272	3,273
Developed Recreation	MRVDs/yr	3,000	2,900	3,000	3,000
Special Interest Areas					
Amount Recommended	Acres	10,883	NA	38,875	449
Visual Resources	# Areas				
Protection of Scenic Viewsheds	Natural Slightly Altered	8 15	15 25	22 24	1 1
Wilderness Capacity					
Wilderness RVDs	RVDs	144,000	899,000	151,000	144,000
Roadless Areas					
Amount Outside of Wilderness	M Acres	118.3	NA	113.8	34.3
Communities					
Employment, 1st Decade	M Jobs	10,322	NA	13,228	10,111
Payments to Counties, 1st Decade	MM$/yr	9.74	NA	12.0	4.0

NA = Not Applicable
NE = Not Estimated

Table II-1 Decision Space and Demand Projections for Issues Indicators (continued)

Output/Effect	Unit of Measure	Existing Condition	Demand Projection	Highest Level	Lowest Level
Economics					
Net Cash Flow	MM$/yr avg.	-3.1	NA		
1st Decade				11.4	-16.3
5th Decade				25.4	-7.6
Noncash Benefits	MM$/yr avg.	80.7[1]	NA		
1st Decade				84.7	76.6
5th Decade				88.0	79.7
Present Net Value	MM$	910.6	NA	1227.6	405.5

NA = Not Applicable

NE = Not Estimated

No Change

This alternative responds to the Regional direction to project the most likely condition of the Forest in the future if current management practices and policies are not changed, and analytical techniques and legal requirements remained as they were when the existing Timber Management Plan was adopted in 1977. As such, this alternative predates the National Forest Management Act regulations, 36 CFR Part 219, of 1979. It uses a commercial forest land base which is 75,000 acres larger than the other alternatives' tentatively suitable base.

This is the only alternative to use the earlier version of the tentatively suitable land base, and it is the only alternative not explicitly responding to MRs. This alternative is identified as Alternative NC.

Emphasis on the RPA Program

This alternative is in response to the 36 CFR 219.12(f)(6) requirement that at least one alternative be developed that responds to and incorporates the RPA Program targets and resource objectives. In this draft EIS, this was Alternative B. For the final EIS, Alternative B was dropped and Alternative C was designated as the alternative which best reflects the values of the RPA program.

Emphasis on Market Opportunities (Regional Direction, November 1983)

In this alternative, the Forest would be managed primarily for outputs with established market prices. These outputs include timber, livestock forage, developed recreation, commercial fisheries, and minerals. This alternative has been identified as Alternative C.

Emphasis on Nonmarket Opportunities (Regional Direction, November 1983)

Alternatives H and I provide nonmarket opportunities in different combinations. In these alternatives, the Forest would be managed primarily for goods and services which do not have established market prices, but nonetheless have significant value. These goods and services include unroaded areas, dispersed recreation, wildlife habitat, fish production and habitat, water quality, and visual quality.

Emphasis on Nondevelopment and Intensified Management

Alternatives E and Q are responsive to nondevelopment as well as intensive management opportunities. Under these alternatives, several of the largest unroaded areas would remain unroaded. Commodity production would be emphasized on the remainder of the Forest.

These alternatives incorporate the MRs and use the best available data regarding the suitability of land for harvesting timber, timber utilization standards, and analytical techniques. Timber harvest levels are determined using the FORPLAN model. This alternative assumes that the MRs are incorporated into the current direction.

Additional alternatives were designed in compliance with 36 CFR 219.12(f)(1) which requires that they reflect the maximum and minimum resource potentials in order to show the full ranges of Forest production capabilities. These additional alternatives are needed to provide a full range of responses to the public issues, management concerns, resource uses, and development opportunities. Alternatives D, F, H, I, J, and K respond to these objectives.

Preferred Alternative

In accordance with 36 CFR 219.12 (I), the Forest Supervisor shall recommend as a preferred alternative the alternative that comes closest to maximizing net public benefits. This selection was made after full evaluation of all factors which contribute to net public benefits and respond to all the public issues. Alternative Q has been selected as the preferred alternative

Alternatives Evaluated and Eliminated From Detailed Study

Benchmarks

Several benchmarks developed during the analysis of the management situation (AMS) became implementable alternatives by modifying them to incorporate multiple resource benefits. The following benchmarks were considered during the development of the alternatives.

Maximum Economic Efficiency (PNV) Benchmark

In this benchmark, the emphasis is on economically efficient management. The benchmark analysis has two basic limits. One is the need to meet MRs for the protection of resources. The other is to assure a nondeclining flow of timber volume over time. The benchmark objective is to maximize present net value (PNV). The land allocations in Alternative C were derived from this benchmark. However, in order to maximize PNV, the benchmark allowed recreation and chargeable timber production in the Bull Run Municipal Watershed. Alternative C, on the other hand, does not open the Bull Run Watershed to recreation. The subsequent discussion of Alternative Q explains why this management option was eliminated from further consideration.

Maximum Timber Benchmark

The difference between this benchmark and the maximum PNV benchmark is the stated objective of maximum timber production. It shares the same concerns about the Bull Run Municipal Watershed that occur in the maximum PNV benchmark. Also, most of the goals of this benchmark, including the objective of maximizing timber production, have been incorporated into Alternative C.

Maximum Unroaded Resource Benchmark

This benchmark responds to the unroaded issue by keeping all remaining, inventoried unroaded areas without roads. However, Alternatives H and I address this issue equally well by maximizing unroaded resource benefits. These two alternatives also provide a mixture of other resources and uses not provided in this benchmark. The original benchmark no longer contributes significantly toward a range of management alternatives.

Maximum Visual Quality Benchmark

This benchmark responds to concerns for the management of visual resources expressed in the recreation issue. However, Alternatives F and I incorporate the benchmark's objective as well as providing a mixture of other resources and uses. The original benchmark was eliminated as failing to contribute significantly toward a broad range of management alternatives.

Maximum Fish and Water Benchmark

This benchmark responds to the group of issues and concerns expressed for fish and water quality. However, Alternative I incorporates the objectives of this benchmark and also provides a mixture of other resources and uses. The original benchmark fails to contribute significantly toward a broad range of management alternatives.

Maximum Wildlife Benchmark

This benchmark responds to a group of issues and concerns expressed for wildlife. Alternative H incorporates the old growth objectives of this benchmark. Another objective of this benchmark is to harvest young stands of trees in order to provide openings for forage needed by some wildlife species. However, this objective was incorporated into other alternatives by establishing habitat improvements projects. Since the objectives of the benchmark have been incorporated into other alternatives, it was not considered as a separate alternative.

Minimum Level Benchmark

The goal of this benchmark is to reduce the management cost of the Forest to a minimum. Under it, management would be at stewardship level with only naturally occurring, incidental outputs. This benchmark is not based on any issue concern for resource management. There is no reasonable basis for carrying it forward as a viable alternative.

Other Alternatives Evaluated and Eliminated From Detailed Study

After the following alternatives were proposed, further analysis showed either that the alternative could not reasonably be implemented, or that another alternative could meet the objective of the alternative. These alternatives were therefore eliminated from further consideration. Specific reasons for rejecting each alternative discussed are provided in the following paragraphs. In describing the timber harvest volumes of the alternatives discussed below, only Allowable Sale Quantity (ASQ), green, volumes estimated by FORPLAN, were included.

Alternative B - RPA

This alternative was eliminated from detailed study because the outputs it would provide are very similar to Alternative C. Alternative C was analyzed in detail.

Alternative D

This alternative was designed to be responsive to a range of needs. It would have provided high levels of timber harvest during the first 30 years of implementation, while also providing a range of other resources. The ID team decided that the outputs that would be provided by this alternative were similar enough to many of the other alternatives that it could be dropped from detailed consideration.

Alternative F - Departure

Prior to the Oregon Wilderness Act of 1984, forests were asked to design an alternative that set aside a significant area of the Forest as Wilderness, while maintaining timber volume by intensive timber management elsewhere on the Forest. A similar analysis is appropriate for the unroaded areas remaining after the Wilderness Act of 1984. A departure on Alternative F was analyzed for possibilities of providing both unroaded areas and timber.

Alternative F provides for managing 80 percent of the remaining unroaded areas as they are. Areas were selected by the ID team which evaluated public interest in all unroaded locations. This alternative also meets all visual quality objectives and most fish and wildlife resource objectives. The timber objective of this alternative was the achievement of the same first decade harvest volume as the Maximum Economic Efficiency Benchmark. This objective is in accordance with planning direction.

Alternative F-departure has been dropped from further consideration for two reasons. First, the timber objective cannot be attained while meeting the objective of a high level of nonmarket outputs. Second, Alternative E also meets most of the objectives of this alternative while coming closer to producing the desired timber volume.

Alternative G

This alternative has the same land allocations as alternative E but does not propose a departure timber sale program. Very little comment from the public was received on this alternative Since the ID team did not feel it added significantly to the range of alternatives, it was dropped from detailed consideration.

Alternative J

The objective of this alternative is to maximize nonmarket values. It is similar to Alternative I, but would preclude timber harvest in selected viewsheds, watersheds, and all old growth timber. As a result, the impact on market values, as indicated by timber volume, would be substantial. These impacts are outlined in the draft EIS.

This alternative was eliminated for two reasons. First, its objectives are addressed adequately in other alternatives The old growth/wildlife habitat issue is satisfied more completely in Alternative H and the unroaded issue is resolved nearly as well in Alternative G. According to the respective resource specialists on the ID team, the visual, and watershed objectives in Alternative J exceed what is necessary to respond to the public issues involved.

Second, the social and economic impact of essentially eliminating the timber program on the Forest would be extreme. The four nearby counties would lose thousands of jobs in the next decade; many of those jobs are in small communities which depend on the forest products industry.

Alternative K

This alternative was designed to meet the timber volume objectives of the Forestry Program for Oregon defined by the Oregon State Department of Forestry as 111.3 MMCF/year (564 MMBF), first decade. However, since the publication of the Draft EIS, the Forestry Program for Oregon has been substantially revised. The program no longer defines timber harvest targets for each national forest. Therefore, this alternative was dropped from detailed consideration. The Timber portion of Chapter II of the FEIS describes the new Forestry Program for Oregon and how the alternatives respond to it.

Alternative L

The ID team selected areas on the Forest which could be managed for nonmarket benefits and assigned priorities to them (this process is discussed in Appendix B). This alternative would achieve these nonmarket benefits only on lands in the highest priority. It would provide special management for the following areas:

- Bull Run Municipal Watershed
- Columbia Gorge and Timberline Lodge Viewsheds
- Areas Susceptible to Earth Flows
- Several Small Special Interest Areas and Research Natural Areas
- Pine/oak Wildlife Habitat
- Selected Fish Habitat and Water Quality Areas
- Remaining Portion of the Olallie Study Area

Subject to these limitations, this alternative would address the timber supply and community stability public issues by providing the maximum possible timber harvest for the first decade. This alternative would depart from the policy requirement of nondeclining flow.

Initial analysis of this alternative for the draft EIS indicated that the timber volume from this alternative would be very similar to Alternative D. This difference was insufficient to justify development of both alternatives.

Alternative M

This alternative is based on the maximum wildlife and maximum fish and water benchmarks from the draft EIS. It is designed to be fully responsive to the group of public issues related to wildlife and fish habitat and water quality resources. In addition, it would retain approximately 75 percent of the remaining nonwilderness/unroaded areas without roads and preserve the natural appearance of the most sensitive viewsheds. As Alternative I responds equally well to the wildlife habitat and fish habitat and water quality resource issues, Alternative M does not offer a significantly different proposal, and it has been eliminated from further consideration.

Alternative N

This alternative would determine where timber should be harvested on the basis of per acre economic efficiency. Under this alternative, lands could be managed for timber only when benefits of such management exceed the costs. This differs from all other alternatives which treat the economic efficiency of timber management on a Forestwide basis rather than a per acre basis.

According to estimates using the FORPLAN linear program model, about 7,000 acres would produce a negative present net value, when analyzed on a per acre basis for timber. These acres support immature timber stands growing on poor sites with high costs of development. An alternative that precluded harvest in such areas (occupying half of one percent of the Forest) would not produce a unique set of outputs and effects and, therefore, it has not been developed further.

Alternative O

This alternative was proposed in response to expected increases in demands for use of the Forest's primitive and semi-primitive nonmotorized, dispersed recreational opportunities. These demands have been addressed to varying degrees in alternatives which emphasize management for dispersed recreation, but most responsively in Alternatives H and I. Both alternatives prohibit development, such as road construction, in unroaded areas, and allow many developed portions of the Forest to return to a primitive condition.

Alternative O proposed further increases in the primitive and semi-primitive nonmotorized recreational opportunities by managing the Bull Run Municipal Watershed for recreational benefits as well as water quality. If the Bull Run Watershed were managed for recreation, 61,000 dispersed unroaded, 350,000 dispersed roaded, and 34,000 developed RVDs would be added per year for the first decade. (RVDs have been defined in the glossary.)

This alternative would violate existing agreements with Portland for managing the Watershed; therefore, opening the Bull Run for recreation is not considered a viable option for Forest management at this time.

Alternative P

A "Proposal for a Mt. Hood National Forest Plan" was submitted by a citizen-interest group in October, 1981. The following description has been taken from the introduction to this proposal.

(The Plan) is designed to provide for the multiple uses of water, timber, wildlife, recreation, and if demand arises, grazing. Objectives of the Plan are to maintain and improve water quality, maintain and enhance fisheries, maximize diversity of plant and animal communities and gene pools, maintain wildlife populations, maintain recreation resources, provide for a large sustained-yield timber harvest in different log sizes, and promote economic efficiency. These objectives would be achieved through designation of three major forest components: general forest lands comprising about 51 percent of the forest; old growth lands made up of 23 percent of the forest; and wilderness composed of 26 percent of the forest. The old growth component would be arranged in corridors one-eighth to two-miles wide (depending upon topography), along river valleys or ridgetops. Old growth corridors would form a web of old growth throughout the forest and serve as connections between wildernesses.

Under the Oregon Wilderness Act, passed in 1984, 65 percent of the area proposed for Wilderness in this alternative would be managed as Wilderness. This law also declared that the suitability of the remaining unroaded areas for Wilderness had been adequately reviewed. Therefore, these areas must be excluded from Wilderness consideration in alternative development for this Forest Plan. This change has rendered the wilderness objectives of the proposed alternative infeasible during this round of planning.

Implementation of the National Forest Management Act will reduce the areas of the Forest suitable for timber production and define the minimum habitat requirements of wildlife species which depend on old growth. These changes materially affect the amount of land to be managed for commercial forest and old growth respectively. Because of significant changes in issues central to this alternative since it was submitted, it has not been developed further.

Among fully developed alternatives, Alternative H places the greatest emphasis on retaining unroaded resources and old growth. However, this alternative would allow only about half as many acres in management similar to the commercial forest land category.

Alternative F appears to be most similar to Alternative P in intent and in distribution of management activities across the Forest. Of the areas proposed for Wilderness in Alternative P, 91 percent are either currently Wilderness or would remain undeveloped in Alternative F. Although Alternative F would designate only 53 percent of the areas proposed for old growth management as provided in Alternative P, Alternative F would create a similar corridor network in order to meet visual objectives. Timber management in the corridor network would be modified to retain mature timber and old growth.

Use of Departures in Alternatives

A "departure" from nondeclining flow (NDF) allows ASQs in future decades to be less than for a preceding decade. NFMA regulations allow for development of alternatives that depart from NDF when conditions indicate that the departure may reasonably be expected to improve overall multiple use objectives (36 CFR 219.16(a)(3)). Departure may meet local economic, social, or biological needs better than a NDF policy.

In developing alternatives for the DEIS, departures were used as one means of addressing multiple use issues. Public response did not indicate substantial support for departure, accordingly, departure was only brought forward in the FEIS in Alternative E.

Alternatives Considered in Detail

The alternatives offer a wide range of approaches to managing the Mt. Hood National Forest. Each alternative responds in a different way to the public issues. The next section of this chapter discusses alternatives in relation to those public issues. Chapter I and Appendix A of the FEIS have additional details about the public issues. Some of the public issues have been reworded from Chapter I in order to make it easier to use them in describing the alternatives

The alternatives differ from each other in the types and amounts of activities that would be permitted. Some alternatives, for example, emphasize intensive timber harvest activities, while others emphasize recreation activities and projects. To achieve these different emphases, each alternative has a different allocation of management areas. These management areas are shown on maps included as part of this FEIS. They represent the definition of the alternative as it would appear on the ground. Standards are written for each management area and are intended to accomplish management objectives.

Factors Common to All Alternatives

There are also management direction and standards that apply Forestwide and are common to all alternatives In general these Forestwide standards are required for compliance with management requirements (MRs) of 36 CFR 219.27, discussed earlier in this chapter, or were adopted from the Pacific Northwest Regional Guide. Others were developed specifically to respond to the environmental conditions on the Forest. Management areas and the management objectives for each area are summarized at the end of this section of Chapter II. Acres by management area by alternative are shown in Table II-3. Forestwide and management area standards are presented in detail in Chapter 4 of the Forest Plan.

The alternatives have some guiding principles in common to make sure they can be implemented. For example, they include a requirement that fluctuations in timber volume be limited to a maximum of 25 percent between decades of the Plan. They also require that regulated harvest of timber stands would not occur before they have reached 95 percent of culmination of mean annual increment (CMAI). Refer to the Glossary for a definition of CMAI.

The Forest is proposing to add three research natural areas (RNA) to the existing system (see Chapter III for a complete discussion of RNAs). These areas proposed for addition are:

- Bull Run Addition (417 acres)
- Big Bend Mountain (5,161 acres)
- Gumjuwac-Tolo (3,623 acres)

These areas are proposed for addition in all alternatives.

The Big Bend and a portion of the Lake Roadless Areas are located within the Bull Run Watershed and allocated to the Bull Run Watershed Management Allocation in all alternatives except C.

Mitigation Measures Common to All Alternatives

A mitigation measure is a program, project, or activity designed to lessen, or mitigate, the undesirable effects of a management activity (40 CFR 1508.20). Many of the standards and guidelines for implementing the preferred alternative serve to mitigate effects of changes in existing conditions (see Chapter 4 of the Forest Plan). In addition, much mitigation is essentially "built in" to many of the alternatives; this is discussed in the resource program section of this chapter as well as Chapter IV of the Final EIS.

This section briefly outlines mitigation measures that are the same in all the alternatives Management activities in all alternatives would be governed by the standards and guidelines, as well as by Best Management Practices (BMPs). BMPs are specifically designed to protect water quality, as required by section 208 of the Clean Water Act. General BMPs will be selected and tailored for site-specific conditions to arrive at project level BMPs for the protection of water quality. See the Final EIS, Appendix H, for a discussion.

Descriptions of the Alternatives

The following pages provide descriptions of the alternatives selected for detailed consideration. They state the objectives of the alternative, discuss the management program designed to accomplish the alternative's objectives, and describe the responsiveness of the alternative to the issues.

Alternative NC (No Change)

Alternative NC at a Glance

Description	Value
Allowable Sale Quantity (ASQ) in the 1st decade (MMBF)	313
Allowable Sale Quantity (ASQ) in the 1st decade (MMCF)	51.6
Payments to counties (1st decade annual average, MM$)	12.0
Jobs dependent on the Forest (% change, 1st decade)	28.1
Existing old growth remaining after 50 years	185,600
Acres of potential old growth including in-growth after 50 years	400,800
Acres of spotted owl habitat after 50 years*	420,000
Viewshed acres managed as natural appearing or slightly altered	111,600
Number of roadless areas maintained as unroaded	3
Acres managed to meet riparian objectives	308,950
Big game habitat capability index	18,200
Percent of SPNM demand to be met in the 5th decade	8%
Wilderness acres	186,200

**This total does not include recruitment through aging of younger stands.*

The No Change alternative was developed in response to decisions made regarding an appeal brought by the Northwest Forest Resource Council. It represents the existing Timber Management Plan (TM Plan), and consequently does not comply with all provisions of the National Forest Management Act (NFMA) and regulations promulgated by the Secretary of Agriculture. Current management is interpreted as the combination of existing Unit Plans and district Multiple Use Plans for specific areas of the Forest, and individual resource plans, including the Timber Management Plan. Current plans do not specifically recognize the requirements to maintain viable populations of animals or the management of more than 4,700 acres for fish habitat and water quality purposes. This alternative does not reflect changes in public issues and management concerns that have surfaced since the existing plans were developed; however, it permits a variety of existing uses to continue.

Legal Perspective

The "No Change" alternative has been developed after the Forest Service held discussions with the Northwest Forest Resource Council which had filed appeal number 1588 on May 19, 1986. Although the appeal was dismissed, the concerns addressed were important. The appeal centered on a decision by then Regional Forester James F. Torrence to "require inclusion of Management Requirements (MRs) in Alternative A, the Current Direction or No Action alternative, for each Forest Plan." The substance of the appeal was that a "true no-action alternative representing current management plans" was not included in Forest Plan DEISs. In response to this, the "No Change" alternative was developed to represent the Mt. Hood's existing Timber Management Plan and, consequently, does not comply with all provisions of the NFMA and the regulations promulgated by the Secretary of Agriculture to implement NFMA, 36 CFR Part 219.

As a result of this direction, the No Change alternative could not be implemented or used in future management of the Forest under the Forest Plan without Congressional and/or Secretary of Agriculture action to change the above laws or regulations.

A strict interpretation of the direction for Alternative NC would produce an ASQ of 339 mmbf per year from a suitable timber land base of 753,000 acres. These outputs were carried forward from the Timber Management (TM) Plan and cannot be modeled in FORPLAN. However, to allow direct comparisons with other alternatives, Alternative NC was modeled in FORPLAN with updates to the suitable land base, the standing volume, and timber yield tables. This produced an ASQ of 313 mmbf per year from a suitable land base of 678,450 acres. This modeled version of Alternative NC incorporates the allocations and management direction contained in the TM Plan and Unit Plans but does not incorporate management requirements and other provisions from NFMA.

Timber Supply

Incorporate the existing Timber Management Plan, adjusted to 1984. Emphasize current silvicultural practices (planting, thinning, and clear-cutting). Use updated information regarding land suitability, yields, and utilization standards. The Allowable Sale Quantity would be 313 mmbf/year.

Old Growth

This alternative would not allow harvest of old growth that is currently protected in wilderness. Some old growth in special interest areas, roadless areas, and other small areas would be set aside from regulated harvest.

Scenic Quality

Assure that at least 12 of the Forest's 46 most sensitive viewsheds do not appear more than slightly altered in 50 years.

Wildlife

Deer and Elk

Under this alternative there would be no Forestwide standards and guidelines for management of deer and elk. There would be some emphasis on winter range management.

Other Management Indicator Species

Under this alternative there are no standards for management of suitable habitat for pileated woodpecker, pine marten, Merriam's turkey or silver-gray squirrel.

Threatened and Endangered Species

The minimum protection of habitat as required by the Threatened and Endangered Species Act would result on the Forest. Implementation of this alternative would not contribute to the recovery of these species. Bald eagle and spotted owl habitat areas (Land Allocation A8 and A13) would be provided under this alternative.

Fish Habitat and Water Quality

Minimize reductions in riparian resource (fish habitat and water quality) capability. Objectives would be met through aggressive application of the TM Plan's Streamside Management Unit and Special Wildlife Habitat (wetlands) direction, as well as very high mitigation/rehabilitation investments (relative to other alternatives).

Recreation

A "standard" level of service (see Glossary) is to be provided. This is intended to meet the demands of the public in a manner which is responsive to changing desires over time relative to the quality of recreational services and facilities provided. Maintain the ability to supply at least these RVDs through the year 2040:

- Primitive (144,000 RVDs)
- Semi-primitive Nonmotorized (108,000 RVDs)
- Semi-primitive Motorized (38,000 RVDs)
- Roaded Natural (2,165,000 RVDs)
- Roaded Modified (6,327,000 RVDs)

- Rural (916,000 RVDs)

Roadless Areas

Harvest may occur at any time in the following areas not included in wilderness or other A type management areas:

- Wind Creek
- Twin Lakes
- Bull of the Woods
- Mt. Hood Additions
- Salmon/Huckleberry
- Badger Creek
- Lake
- Eagle
- Roaring River
- Olallie
- Larch Mountain

The roadless character of Larch, Olallie, and Eagle areas will remain, even though some timber harvest may occur.

Communities

This alternative would result in about a 2.3 percent increase in the total jobs related to timber harvest on the Mt. Hood National Forest. Total recreation related jobs would increase by about 43.7 percent, resulting in a net increase of about 2,906 jobs over the first decade.

Implementation of this alternative would indirectly benefit communities with a large proportion of employment in the wood products industry because it would maintain current timber harvest levels. Communities such as Estacada, Molalla, and Maupin would probably see a continuation of current wood products employment levels. This is not assuming any effect from other influences, such as the listing of threatened or endangered species, market conditions, or productivity changes.

Smaller communities, such as those in the Mt. Hood Corridor, where a large portion of jobs are in recreation and tourism industries, would see an increase in jobs and possibly in overall economic growth. Lifestyles may be affected as outsiders move to the area.

Many rural communities have substantial employment in both wood products and tourism; these communities may be able to capitalize on the growth in recreation to create jobs. This alternative does not present a balanced mix of resource outputs. This lack of balance would cause continued conflict with (urban) publics who want to emphasize amenity values.

This alternative is responsive to those communities that are highly dependent on wood products industry jobs. It would provide a relatively high level of timber harvest which could support a fairly high level of wood products industry jobs. Payments to counties would be relatively high.

Canoeists enjoy solitude on the river.

Wild, Scenic, and Recreational Rivers

There are no rivers found eligible or suitable under the Wild and Scenic Rivers Act. Corridors along potentially eligible rivers would be open to a range of management activities, some of which could noticeably alter the values that contribute to their eligibility.

Special Interest Areas

This alternative would designate these Special Interest Areas:

- Barlow Tollgate
- Columbia Gorge Old Wagon Road
- Little Crater Lake
- Little Crater Lake Expansion
- Olallie Lake
- Olallie Lake Expansion
- Mill Creek Buttes
- Oneonta Gorge

Cultural Resources/Native American Uses

Cultural Resources

Required inventories would be completed to minimally acceptable standards for timber harvest, road construction and other ground disturbing projects. Cultural sites would be avoided wherever possible. Sites would be evaluated and mitigated only if threatened by unavoidable impacts. There would be little or no monitoring. The condition of historic buildings and structures would continue rapid decline. Almost no cultural resource sites would be nominated to the National Register or interpreted for public enrichment.

Traditional Indian Resources

The current decline in the availability of traditional resources would continue. The quality and quantity of coordination with local tribes would vary depending upon the nature and number of resource projects and activities undertaken. For example, the opening of areas through timber harvest offers opportunities to coordinate with the tribes in reestablishing huckleberries and/or improving upon their location and accessibility. However, under Alternative NC, such opportunities would almost never be acted upon. Coordination would usually consist of notifying local tribes about upcoming projects that may affect areas which concern them.

Alternative A (No Action)

Alternative A at a Glance

Description	Value
Allowable Sale Quantity (ASQ) in the 1st decade (MMBF)	235
Allowable Sale Quantity (ASQ) in the 1st decade (MMCF)	38.9
Payments to counties (1st decade annual average, MM$)	8.9
Jobs dependent on the Forest (% change, 1st decade)	14.1
Existing old growth remaining after 50 years	225,000
Acres of potential old growth including in-growth after 50 years.	443,700
Acres of spotted owl habitat after 50 years*	458,000
Viewshed acres managed as natural appearing or slightly altered	116,000
Number of roadless areas maintained as unroaded	3
Acres managed to meet riparian objectives	473,750
Big game habitat capability index	22,300
Percent of SPNM demand to be met in the 5th decade	13%
Wilderness acres	186,200

**This total does not include recruitment through aging of younger stands.*

Alternative A is designed to present estimates of the outputs and effects of managing the Forest under current plans and practices, adjusted as required by new laws and regulations, including meeting the MRs for wildlife species and soil and water resources, and incorporating new timber suitability criteria. Alternative A would permit a variety of existing uses to continue, including present timber management practices. This alternative projects results of managing in the future without regard to public issues or management concerns that have arisen since existing plans were approved, aside from the MRs. The cost of Alternative A is within existing budget requests.

Timber Supply

Produce the highest amount of timber possible, given the following: a harvest policy of nondeclining flow, existing land allocations plus MRs, and existing silvicultural preferences (emphasizing planting, thinning, and clearcutting). For this and all remaining alternatives, use current data regarding land suitability, yields, and utilization standards. The allowable sale quantity would be 235 mmbf/year.

Old Growth

This alternative would not allow harvest of old growth that is currently protected in wilderness. Some old growth in special interest areas, roadless areas, and other small areas would be set aside from regulated harvest.

Scenic Quality

Assure that at least 12 of the Forest's 46 most sensitive viewsheds do not appear more than slightly altered in 50 years.

Wildlife

Deer and Elk

Under this alternative there would be no Forestwide standards and guidelines for management of deer and elk. There would be some emphasis on winter range management.

Other Management Indicator Species

This alternative would meet the management requirements (MRs) for pileated woodpecker and pine marten. Management would consist of 96 MR areas for pileated woodpecker and 231 MR areas for pine marten (600 acres and 320 acres, respectively). No standards and guidelines would exist under this alternative for turkey and squirrel.

Threatened and Endangered Species

Under this alternative, only minimum protection for spotted owls as defined in the preferred alternative of the Final Supplemental Environmental Impact Statement to the Pacific Northwest Regional Guide would be implemented. Sixty-six management areas would be maintained, each containing 1,500 acres of suitable spotted owl habitat.

The minimum protection of habitat as required by the Threatened and Endangered Species Act would result on the Forest for the other Threatened and Endangered species. Implementation of this alternative would not contribute to the recovery of those species.

Fish Habitat and Water Quality

Maintain forestwide riparian resource (fish habitat and water quality) capability at or near present levels.

Objectives would be accomplished primarily through managing riparian land at the MR level and a mitigation/rehabilitation program of a moderate annual investment level (relative to other alternatives).

Recreation

A "standard" level of service is to be provided. This is intended to meet the demands of the public in a manner which is responsive to changing desires over time relative to the quality of recreational services and facilities provided. Maintain the ability to supply at least these RVDs through the year 2040:

- Primitive (144,000 RVDs)
- Semi-primitive Nonmotorized (172,000 RVDs)
- Semi-primitive Motorized (28,000 RVDs)
- Roaded Natural (3,274,000 RVDs)
- Roaded Modified (4,816,000 RVDs)
- Rural (916,000 RVDs)

Roadless Areas

During the next 10 years, timber may be harvested in the Mt. Hood Additions, Salmon/Huckleberry, Badger Creek, Wind Creek, Twin Lakes, Bull of the Woods, Lake, Roaring River, Olallie, and Larch Mtn. areas. Harvest may not take place at any time in the Eagle area. The roadless character of Larch, Olallie and Eagle areas will be protected.

Communities

This alternative would result in about 23.2 percent decrease in the total jobs related to timber harvest on the Mt. Hood National Forest. Total recreation related jobs would increase by about 36.4 percent, resulting in a net increase of about 1,452 jobs over the first decade.

Implementation of this alternative would result in more recreation use on the Forest through growth in demand. This would tend to benefit urban users. Smaller communities, such as those in the Mt. Hood Corridor, where a large portion of jobs are in recreation and tourism industries, would see an increase in jobs and possibly in overall economic growth.

Communities where many people work in the wood products industry, such as Estacada, Molalla, and Maupin, would see jobs lost in that industry; this may result in out-migration and a loss in stability.

Many rural communities have substantial employment in both wood products and tourism; these communities may be able to capitalize on the growth in recreation to create jobs. This alternative presents a somewhat balanced mix of resource outputs but does not provide strong direction for managing the Forest. This could create instability as management on the Forest continues to be influenced by constantly changing social conditions.

This alternative is responsive to those communities that are highly dependent on wood products industry jobs. It would provide a relatively high level of timber harvest which could support a fairly high level of wood products industry jobs. Payments to counties would be relatively high.

Wild , Scenic and Recreational Rivers

The following rivers were all found eligible for consideration as Wild and Scenic Rivers under the Wild and Scenic Rivers Act. Interim protection of these rivers would continue until it is determined that the river is not suitable for inclusion into the national system.

- Middle fork of the Hood River
- A portion of the ZigZag River
- Eagle Creek in Clackamas County
- North Fork of the Clackamas River
- A portion of the South Fork of the Clackamas River
- Fish Creek
- South fork of the Roaring River
- A portion of the Oak Grove Fork of the Clackamas River
- Collawash River
- North Fork of the North Fork of the Breitenbush River

The East Fork of the Hood River was found eligible but would not be recommended for designation under the Wild and Scenic Rivers Act. The river corridor of segment two would be in management area A11. It would be open to a range of ski area management activities, some of which could noticeable alter the values that contributed to its eligibility. The corridor of segment three would primarily be in management area B2, and thus would be managed for protection of scenic qualities

Special Interest Areas

This alternative would designate these Special Interest Areas:

- Barlow Tollgate
- Columbia Gorge Old Wagon Road
- Little Crater Lake
- Little Crater Lake Expansion
- Olallie Lake
- Olallie Lake Expansion
- Mill Creek Buttes
- Oneonta Gorge

Cultural Resources/Native American Uses

Cultural Resources

Required inventories would be completed to minimally acceptable standards for timber harvest, road construction and other ground disturbing projects. Sites would be protected from project impacts primarily by avoidance. Sites would be evaluated and mitigrated only if threatened by unavoidable impacts. There would be little or no monitoring. The condition of historic buildings and structures would continue rapid decline. Almost no cultural resources sites would be nominated to the National Register or interpreted for public enrichment.

Traditional Indian Resources

The current decline in the availability of traditional resources would continue. The quality and quantity of coordination with local tribes would vary depending upon the nature and number of resource projects and activities undertaken. For example, the opening of areas through timber harvest offers opportunities to coordinate with the tribes in reestablishing huckleberries and/or improving upon their location and accessibility. However, under Alternative A, such opportunities would almost never be acted upon. Coordination would usually consist of notifying local tribes about upcoming projects that may affect areas which concern them.

Alternative C

Alternative C at a Glance

Description	Value
Allowable Sale Quantity (ASQ) in the 1st decade (MMBF)	282
Allowable Sale Quantity (ASQ) in the 1st decade (MMCF)	46.4
Payments to counties (1st decade annual average, MM$)	11.0
Jobs dependent on the Forest (% change, 1st decade)	19.1
Existing old growth remaining after 50 years	205,500
Acres of potential old growth including in-growth after 50 years	422,300
Acres of spotted owl habitat after 50 years*	434,000
Viewshed acres managed as natural appearing or slightly altered	34,500
Number of roadless areas maintained as unroaded	2
Acres managed to meet riparian objectives	374,275
Big game habitat capability index after 50 years	21,300
Percent of SPNM demand to be met in the 5th decade	10%
Wilderness acres	186,200

** This total does not include recruitment through aging of younger stands.*

This alternative was developed in response to the public issues concerning adequate timber supplies and community stability. It would provide maximum timber harvests during the next thirty years consistent with resource protection provided by management requirements. Alternative C most closely approximates the RPA program for the Mt. Hood National Forest. Under Alternative C all land suitable for growing trees would be managed for intensive timber production. Timber harvesting would be on a regularly scheduled basis in the Bull Run Watershed.

Timber Supply

Subject to a nondeclining flow constraint, produce as much timber as possible in the first decade. Manage timber intensively, using such practices as planting and thinning. Offer an allowable sale quantity of 282 mmbf/year

Old Growth

This alternative would not allow harvest of old growth that is currently protected in wilderness. Some old growth in special interest areas, roadless areas, and other small areas would be set aside from regulated harvest.

Scenic Quality

Assure that at least 2 of the Forest's 46 most sensitive viewsheds do not appear more than slightly altered in 50 years.

Wildlife

Deer and Elk

Under this alternative there would be no Forestwide standards and guidelines for management of deer and elk. There would be some emphasis on winter range management.

Other Management Indicator Species

This alternative would meet the management requirements (MRs) for pileated woodpecker and pine marten. Management would consist of 96 MR areas for pileated woodpecker and 231 MR areas for pine marten. No standards and guidelines would exist under this alternative for turkey and squirrel.

Threatened and Endangered Species

Under this alternative protection for spotted owls as defined by the Final Supplemental Environmental Impact Statement to the Pacific Northwest Regional Guide would be implemented. Sixty-six management areas would be maintained, each containing 1500 acres of suitable spotted owl habitat.

The minimum protection of habitat as required by the Threatened and Endangered Species Act would result on the Forest for the other Threatened and Endangered Species. Implementation of this alternative would not contribute to the recovery of those species.

Fish Habitat and Water Quality

Maintain forest-wide riparian and watershed resource capability at or near present levels. Objectives would be met through MR level riparian management areas. This alternative would also implement a mitigation and rehabilitation program that would be more costly than what would be done under other alternatives

The Bull Run would be managed intensively for timber production.

Recreation

A "standard" level of service is to be provided. This is to meet the demands of the public in a manner which responds to changing desires over time relative to the quality of recreational services and facilities provided. Maintain the ability to supply at least these RVDs through the year 2040:

- Primitive (144,000 RVDs)
- Semi-primitive Nonmotorized (138,000 RVDs)
- Semi-primitive Motorized (5,000 RVDs)
- Roaded Natural (2,119,000 RVDs)
- Roaded Modified (6,376,000 RVDs)
- Rural (923,000 RVDs)

Roadless Areas

Timber may be intensively harvested in all roadless areas outside wilderness or an A-type management area. The roadless character of Larch and Eagle will be maintained.

Communities

This alternative would result in about a 7.8 percent decrease in the total jobs related to timber harvest on the Mt. Hood National Forest. Total recreation related jobs would increase by about 35.3 percent, resulting in a net increase of about 1,977 jobs over the first decade.

The focus of this alternative would be to maximize timber production at the expense of other resources. However, it would still propose a timber sale program lower than what has been offered in the past; this could result in some job losses in the wood products industry. This would tend to affect communities where many people work in the wood products industry, such as Estacada, Molalla, and Maupin.

Many rural communities have substantial employment in both wood products and tourism; these communities may be able to capitalize on the growth in recreation to create jobs. Communities that have traditionally had a lot of recreation related employment, such as those in the Mt. Hood Corridor, would probably see job growth over the first decade as recreation use on the Forest increases.

This alternative does not present a balanced mix of resource outputs. This lack of balance would be a destabilizing force on Forest management since it would be a focus of conflict.

This alternative is responsive to those communities that are highly dependent on wood products industry jobs. It would provide a relatively high level of timber harvest which could support a fairly high level of wood products industry jobs. Payments to counties would be relatively high.

Wild, Scenic, and Recreational Rivers

The following rivers were all found eligible for consideration as Wild and Scenic Rivers under the Wild and Scenic Rivers Act. Interim protection of the river corridor and area viewed from the river and major travelways along the river would continue until it is determined that the river is not suitable for inclusion into the national system.

- Middle fork of the Hood River
- A portion of the ZigZag River
- Eagle Creek in Clackamas County
- North Fork of the Clackamas River
- A portion of the South Fork of the Clackamas River
- Fish Creek
- South fork of the Roaring River
- A portion of the Oak Grove Fork of the Clackamas River
- Collawash River
- North Fork of the North Fork of the Breitenbush River

The East Fork of the Hood River was found eligible but would not be recommended for designation under the Wild and Scenic Rivers Act. The river corridor of segment two would be in management area A11. It would be open to a range of ski area management activities, some of which could noticeable alter the values that contributed to its eligibility. The corridor of segment three would primarily be in management area C1. This is an area managed intensively for timber production, which could noticeably alter the values that contributed to its eligibility.

Special Interest Areas

This alternative would designate these Special Interest Areas:

- Barlow Tollgate
- Columbia Gorge Old Wagon Road
- Little Crater Lake
- Little Crater Lake Expansion
- Oneonta Gorge

Cultural Resources/Native American Uses

Cultural Resources

Required inventories would be completed to minimally acceptable standards for timber harvest, road construction and other ground disturbing projects. A large number of sites would be evaluated and mitigated by data recovery to open up protected acres for timber harvest. Monitoring would increase for cultural sites located close to harvest activities. Almost no sites are nominated to the National Register or interpreted for public enrichment.

Traditional Indian Resources

The availability of traditionally sun loving plant resources, like huckleberries, would increase dramatically. Other traditional plan resources would continue to decline. Availability of deer, elk and fisheries resources would remain at about present levels. The quality and quantity of coordination with local tribes would vary depending upon the nature and number of resource projects and activities undertaken. For example, the opening of areas through timber harvest offers opportunities to coordinate with the tribes in reestablishing huckleberries and/or improving upon their location and accessibility. Under Alternative C, a number of such opportunities would be acted upon because of the large volume of timber harvested.

Alternative E

Alternative E at a Glance

Description	Value
Allowable Sale Quantity (ASQ) in the 1st decade (MMBF)	317
Allowable Sale Quantity (ASQ) in the 1st decade (MMCF)	53.4
Payments to counties (1st decade annual average, MM$)	11.8
Jobs dependent on the Forest (% change, 1st decade)	24.8
Existing old growth remaining after 50 years	223,900
Acres of potential old growth including in-growth after 50 years	429,600
Acres of spotted owl habitat after 50 years*	445,000
Viewshed acres managed as natural appearing or slightly altered	212,100
Number of roadless areas maintained as unroaded	3
Acres managed to meet riparian objectives	517,250
Big game habitat capability index	24,600
Percent of SPNM demand to be met in the 5th decade	16%
Wilderness acres	186,200

**This total does not include recruitment through aging of younger stands.*

This was the Forest's preferred alternative in the draft EIS. It was developed to reflect present land uses while meeting MRs. It is based on an assumption that past determinations of management emphasis in previous plans are still generally valid and effective when also reflecting the most recent laws and scientific information. This alternative reflects more recently identified needs to reduce timber harvest levels on some portions of the Forest in response to the public issues of water quality, fish and wildlife, and recreation. It also emphasizes the values of particular scenic corridors. Recreation of all kinds would be available and its quality would meet public demands. Timber would be managed intensively where such intensive management has been planned in the past, including seven of the presently unroaded areas. Timber harvest would often be used to help achieve other Forest objectives. In response to the community stability public issue, the timber harvest schedule would be a departure which emphasizes production of volume above this alternative's long-term sustained yield quantity.

Timber Supply

Produce as much timber as possible during the first decade, given the land allocations derived from current plans, new legal requirements and issues and management concerns. Do not reduce harvests more than 25 percent per decade and maintain harvests at or above long-term sustained yield every decade. Generally, use intensive practices such as planting and thinning where economically efficient to do so. The allowable sale quantity would be 317 mmbf/year.

Old Growth

Some old growth in special interest areas, roadless areas, and other small areas would be set aside from regulated harvest.

Scenic Quality

Assure that at least 21 of the Forest's 46 most sensitive viewsheds do not appear more than slightly altered in 50 years.

Wildlife

Deer and Elk

Under this alternative standards and guidelines for deer and elk winter range would be incorporated.

Other Management Indicator Species

This alternative would meet the management requirements (MRs) for pileated woodpecker and pine marten. Management would consist of 96 MR areas for pileated woodpecker and 231 MR areas for pine marten (600 acres and 320 acres, respectively).

Standards and guidelines for turkey and squirrel would be incorporated under this alternative Management emphasis and a specific land allocation (B4) would be provided on the east side of the forest for approximately half of the turkey and squirrel range.

This alternative was modified between draft and final EIS to respond to the new regional direction for spotted owl habitat management. Under this alternative, spotted owl management as defined in the preferred alternative of the Final Supplemental Environmental Impact Statement to the Pacific Northwest Regional Guide would be implemented. Sixty-six management areas would be maintained, each containing 1,500 acres of suitable spotted owl habitat.

Threatened and Endangered Species

Minimum protection of habitat as required by the Threatened and Endangered Species Act would be the minimum protection for the other threatened and endangered species present on the forest. Implementation of this alternative would not contribute to the recovery of those species.

Fish Habitat and Water Quality

Provide for modest, long-term increases in Forestwide riparian resource (fish habitat and water quality) capabilities.

In addition to a mitigation and rehabilitation program of moderate annual investment levels, a Forestwide enhancement program would be initiated at highest priority sites. These programs would complement riparian area management above the MR level similar to those described in Alternative F. Due to accelerated timber harvest schedules, estimated increases in riparian resource capability would necessitate demanding planning and maintenance of rehabilitation and enhancement projects and may require extended time periods for improvements to become evident.

Recreation

Provide a "standard" level of service in order to meet the demands of the public in a manner which is responsive to changing desires over time relative to the quality of recreational services. Maintain the ability to supply at least these RVDs through the year 2040:

- Primitive (144,000 RVDs)
- Semi-primitive Nonmotorized (217,000 RVDs)
- Semi-primitive Motorized (20,000 RVDs)
- Roaded Natural (3,841,000 RVDs)
- Roaded Modified (4,007,000 RVDs)
- Rural (931,000 RVDs)

Roadless Areas

During the next 10 years timber may be harvested in portions of the Eagle, Lake, Salmon-Huckleberry, Wind Creek, Twin Lakes, Bull of the Woods, Mt. Hood Additions, Badger Creek, Larch Mtn. and Roaring River areas. The roadless qualities of Olallie, Larch and Eagle will remain.

Communities

This alternative would result in about a 3.6 percent increase in the total jobs related to timber harvest on the Mt. Hood National Forest. Total recreation related jobs would increase by about 37.5 percent, resulting in a net increase of about 2,561 jobs over the first decade.

Implementation of this alternative would at first benefit communities such as Estacada, Molalla, and Maupin, in which many people work in the wood products industry. However, because this alternative proposes a departure timber sale, sales would drop sharply after the first decade. This could be a destabilizing force on these communities.

Many rural communities have substantial employment in both wood products and tourism; these communities may be able to capitalize on the growth in recreation to create jobs. Communities that have traditionally had a lot of recreation related employment, such as those in the Mt. Hood Corridor, would probably see job growth over the first decade as recreation use on the Forest increases. Over the long run, this alternative presents a balanced mix resource outputs. However, the fact that it would serve to intensify conflict surrounding that single issue.

This alternative responds moderately well to those communities that are highly dependent on wood products industry jobs. It would provide a level of timber harvest which could support many jobs, but which would be lower than recent levels. This alternative has a departure timber schedule, which means higher levels of timber would be sold in the early decades in order to ease this downward transition. Payments to counties would be relatively high. This alternative would also protect some of the highest quality recreation opportunities on the Forest, thereby helping the growth of the recreation industry.

Wild, Scenic, and Recreational Rivers

The following rivers were all found eligible for consideration as Wild and Scenic Rivers under the Wild and Scenic Rivers Act. Interim protection of the river corridor and area viewed from the river and major travelways along the river would continue until it is determined that the river is not suitable for inclusion into the national system.

- Middle fork of the Hood River
- A portion of the ZigZag River
- Eagle Creek in Clackamas County
- North Fork of the Clackamas River
- A portion of the South Fork of the Clackamas River
- Fish Creek
- South fork of the Roaring River
- A portion of the Oak Grove Fork of the Clackamas River
- Collawash River
- North Fork of the North Fork of the Breitenbush River

The East Fork of the Hood River was found eligible but would not be recommended for designation under the Wild and Scenic Rivers Act. The river corridor of segment two would be in management area A11. It would be open to a range of ski area management activities, some of which could noticeable alter the values that contributed to its eligibility. The corridor of segment three would primarily be in management area B2 and B9, and thus would be managed for protection of scenic qualities and enhancement of wildlife values.

Special Interest Areas

This alternative would designate these Special Interest Areas:

- Barlow Tollgate
- Columbia Gorge Old Wagon Road
- Little Crater Lake
- Little Crater Lake Expansion
- Olallie Lake
- Olallie Lake Expansion
- Barlow Road
- Larch Mountain
- Roaring River
- Lost Lake
- Bagby Hot Springs
- Sugar Pine
- Squaw Meadows
- Parkdale Lava Beds
- Oneonta Gorge

Cultural Resources/Native American

Cultural Resources

Required inventories would be completed to minimally acceptable standards for timber harvest, road construction and other ground disturbing projects. Cultural resources would be avoided by project design. Sites would be evaluated only if threatened by unavoidable impacts. Several sites would be mitigated through data recovery, especially in the first 10 years. There would be some regular monitoring. A few sites would be nominated to the National Register an several are interpreted for public enrichment. A few historic buildings and structures would be stabilized and interpreted.

Traditional Indian Resources

The availability of some traditional resources, like huckleberries, deer and elk would increase slightly. The quality and quantity of coordination with local tribes would vary depending upon the nature and number of resource projects and activities undertaken. For example, the management of areas for both timber harvest as well as for deer and elk offers opportunities to coordinate with the tribes in reestablishing these resources and/or improving upon their location and accessibility. Under Alternative E, such opportunities would be acted upon because of the number of timber harvests and projects to improve deer and elk range.

Alternative F

Alternative F at a Glance

Description	Value
Allowable Sale Quantity (ASQ) in the 1st decade (MMBF)	154
Allowable Sale Quantity (ASQ) in the 1st decade (MMCF)	31.9
Payments to counties (1st decade annual average, MM$)	5.8
Jobs dependent on the Forest (% change, 1st decade)	4.5
Existing old growth remaining after 50 years	262,000
Acres of potential old growth including in-growth after 50 years	493,100
Acres of spotted owl habitat after 50 years*	508,000
Viewshed acres managed as natural appearing or slightly altered	375,900
Number of roadless areas maintained as unroaded	9
Acres managed to meet riparian objectives	577,350
Big game habitat capability index after 50 years	30,600
Percent of SPNM demand to be met in the 5th decade	23%
Wilderness acres	186,200

**This total does not reflect recruitment through aging of younger stands.*

This alternative was developed as a particular response to the recreation public issue, especially the visual quality aspects of the issue. It is designed to meet the needs of visitors to the Forest for outdoor recreation in natural settings. Its main objective is to provide scenic landscapes that are visible from the Forest's travel routes and recreation areas. Under this alternative, the emphasis of management would be on providing a wide range of roaded and unroaded recreational settings and opportunities. Natural appearing conditions would be perpetuated by periodic removal of small volumes of timber in areas that are visible. Higher levels of timber harvest would take place in areas of the Forest that are seldom seen. Benefits to wildlife and fish habitat would occur because of management of the land for scenic quality.

Timber Supply

Produce as much timber as is feasible while still meeting visual requirements. Use intensive management practices such as planting and thinning only where economically efficient to do so. Offer an allowable sale quantity of 154 mmbf/year

Old Growth

Some old growth in special interest areas, roadless areas, and other small areas would be set aside from regulated harvest.

Scenic Quality

Assure that at least 40 of the Forest's 46 most sensitive viewsheds do not appear more than slightly altered in 50 years.

Wildlife

Deer and Elk

Under this alternative standards and guidelines for deer and elk winter range would be incorporated, as well as additional management protection provided by a winter range land allocation, B10.

Other Management Indicator Species

This alternative would meet the management requirements (MRs) for pileated woodpecker and pine marten. Management would consist of 96 MR areas for pileated woodpecker and 231 MR areas for pine marten.

Standards and guidelines for turkey and squirrel would be incorporated under this alternative Management emphasis and a specific land allocation (B4) would be provided on the east side of the forest for approximately half of the turkey and squirrel range.

Threatened and Endangered Species

Under this alternative only the minimum protection as defined by the Final Supplemental Environmental Impact Statement to the Pacific Northwest Regional Guide would be implemented for spotted owls. Sixty-six management areas would be maintained, each containing 1500 acres of suitable spotted owl habitat.

Bald eagle habitat areas (land allocation A13) would be provided under this alternative. Minimum protection of habitat as required by the Threatened and Endangered Species Act would be the minimum protection for the other threatened and endangered species present on the Forest.

Fish Habitat and Water Quality

Provide for significant, long-term increases in Forestwide riparian resource (fish habitat and water quality) capabilities. This would be accomplished through major, additional riparian and watershed land allocations, application of an aggressive program to eliminate the backlog of rehabilitation projects, and active pursuit of most enhancement opportunities.

Recreation

A "standard" level of service is to be provided. This is intended to meet the demands of the public in a manner which is responsive to changing desires over time relative to the quality of recreational services and facilities provided. Maintain the ability to supply at least these RVDs through the year 2040:

- Primitive (144,000 RVDs)
- Semi-primitive Nonmotorized (312,000 RVDs)
- Semi-primitive Motorized (35,000 RVDs)
- Roaded Natural (5,055,000 RVDs)
- Roaded Modified (2,035,000 RVDs)
- Rural 795,000 RVDs)

Roadless Areas

Timber may be harvested in the Badger Creek, Bull of the Woods, Eagle, Larch Mountain, Mt. Hood Additions, Roaring River, Salmon-Huckleberry, Twin Lakes, Lake and Wind Creek areas during the next 15 years. Refrain from harvesting in the Olallie area at any time. The roadless qualities of all the areas except Mt. Hood Additions and Roaring River will be protected.

Communities

This alternative would result in about a 49.7 percent decrease in the total jobs related to timber harvest on the Mt. Hood National Forest. Total recreation related jobs would increase by about 36.9 percent, resulting in a net increase of about 461 jobs over the first decade.

Implementation of this alternative would indirectly benefit urban communities in the Portland metropolitan area because of an increased emphasis on recreation and "amenity" resources. Smaller communities, such as those in the Mt. Hood Corridor, where a large portion of jobs are in recreation and tourism industries, would see an increase in jobs and possibly in overall economic growth. Lifestyles may be affected as outsiders move to the area.

Communities where many people work in the wood products industry, such as Estacada, Molalla, and Maupin, would see jobs lost in that industry; this may result in out-migration and a loss of stability.

Many rural communities have substantial employment in both wood products and tourism; these communities may be able to capitalize on the growth in recreation to create jobs. This alternative focuses on recreation outputs. It specifically sets aside more land than other alternatives for more primitive types of opportunities. This could intensify conflict if the alternative is perceived as being created for a special group of recreationists.

This alternative is not very responsive to those communities that are highly dependent on wood products industry jobs. It would provide a level of timber harvest which could support many jobs, but which would be lower than recent levels. Payments to counties would be moderate.

This alternative would also respond well to the needs of those communities where recreation is an important part of the economy. It would provide a high level of recreation, and also protect some of the highest quality recreation opportunities on the Forest, thereby helping the growth of the recreation industry.

Wild, Scenic, and Recreational Rivers

The following rivers were all found eligible for consideration as Wild and Scenic Rivers under the Wild and Scenic Rivers Act. Interim protection of the river corridor and area viewed from the river and major travelways along the river would continue until it is determined that the river is not suitable for inclusion into the national system.

- Middle fork of the Hood River
- A portion of the ZigZag River
- Eagle Creek in Clackamas County
- North Fork of the Clackamas River
- A portion of the South Fork of the Clackamas River

- Fish Creek
- South fork of the Roaring River
- A portion of the Oak Grove Fork of the Clackamas River
- Collawash River
- North Fork of the North Fork of the Breitenbush River

The East Fork of the Hood River would be recommended for designation under the Wild and Scenic Rivers Act. The proposed classification is:

Segment Number	Classification	Miles	Segment
2	Recreational	1.5	Umbrella Falls to State Highway 35 below Sahalie Falls
3	Recreational	13.4	State Highway 35 below Sahalie Falls to Forest boundary

Special Interest Areas

This alternative would designate these Special Interest Areas:

- Barlow Tollgate
- Columbia Gorge Old Wagon Road
- Little Crater lake
- Little Crater Lake Expansion
- Olallie Lake
- Olallie Lake Expansion
- Barlow Road
- Larch Mountain
- Roaring River
- Lost Lake
- Bagby Hot Springs
- Sugar Pine
- Squaw Meadows
- Parkdale Lava Beds
- Oneonta Gorge
- Cloud Cap-Tilly Jane
- Old Maids Flat
- Clackamas Lake

Cultural Resources/Native American Uses

Cultural Resources

Required inventories would be completed for timber harvest, road construction and other ground disturbing projects. Additional inventory would be completed along wild and scenic river corridors and in wilderness, especially in the more heavily used areas. Several thematic evaluations would be conducted to aid interpretive planning for cultural sites. A few sites would be excavated to mitigate visitor impacts and to enhance public archaeology opportunities. Several cultural sites would be interpreted and a few would be nominated to the National Register. A number of sites would be regularly monitored.

Traditional Indian Resources

The availability of huckleberry resources would tend to decline. Deer and elk would remain unchanged or decline slightly. Fisheries resources and other plant resources would tend to increase. The quality and quantity of coordination with local tribes would vary depending upon the nature and number of resource projects and activities undertaken. For example, the opening of areas through timber harvest tends to increase opportunities for reestablishing huckleberries and/or improving upon their location and accessibility. Under Alternative F, few such opportunities would exist. The increased number of riparian projects, however, would promote long term coordination with local tribes concerned about fisheries, related plant habitats and water quality.

Alternative H

Alternative H at a Glance

Description	Value
Allowable Sale Quantity (ASQ) in the 1st decade (MMBF)	108
Allowable Sale Quantity (ASQ) in the 1st decade (MMCF)	18.1
Payments to counties (1st decade annual average, MM$)	4.0
Jobs dependent on the Forest (% change, 1st decade)	1.0
Existing old growth remaining after 50 years	290,100
Acres of potential old growth including in-growth after 50 years	523,300
Acres of spotted owl habitat after 50 years*	644,000
Viewshed acres managed as natural appearing or slightly altered	367,900
Number of roadless areas maintained as unroaded	9
Acres managed to meet riparian objectives	768,650
Big game habitat capability index after 50 years	33,900
Percent of SPNM demand to be met in the 5th decade	17%
Wilderness acres	186,200

**This total does not reflect recruitment through aging of younger stands.*

Alternative H would preserve the most existing old growth. Retaining old growth would provide complementary benefits for fish and wildlife habitats, and maintain or improve scenic quality. This alternative would also allow for primitive and natural recreation experiences. Timber would be harvested only in areas where it has been removed in the past, and where it would not conflict with the needs of dispersed recreational activities.

Timber Supply

Harvest timber only in areas where it has been cut in the past and where these harvests will not conflict with other resource objectives. Use intensive management practices such as planting and thinning only where it is economically efficient to do so. Offer an allowable sale quantity of 108 mmbf/year

Old Growth

This alternative would allocate much of the existing old growth on the forest to be used as wildlife habitat and for its recreation and scenic value.

Scenic Quality

Assure that at least 42 of the Forest's 46 most sensitive viewsheds do not appear more than slightly altered in 50 years.

Wildlife

Deer and Elk

Under this alternative standards and guidelines for deer and elk winter range would be incorporated, as well as additional management protection provided through land allocations B10 and B11. Implementation of this alternative would result in moderate population numbers due to an overall decrease in forage areas, but an expected quality increase in size and spacing of those units and more optimal thermal cover.

Other Management Indicator Species

This alternative would meet the management requirements (MRs) for pileated woodpecker and pine marten. Management would consist of 96 MR areas for pileated woodpecker and 231 MR areas for pine marten.

Standards and guidelines for turkey and squirrel would be incorporated under this alternative Management emphasis and a specific land allocation (B4) would be provided on the east side of the Forest for approximately half of the turkey and squirrel range.

Threatened and Endangered Species

Under this alternative, 72 spotted owl management areas would be maintained, each containing 1875 acres of suitable spotted owl habitat. Due to habitat in other allocations, this is the only alternative that would increase the population of spotted owls after 50 years.

Bald eagle habitat areas would be provided under this alternative (land allocation A13).

Fish Habitat and Water Quality

Provide for substantial, long-term increases in Forestwide riparian resource (fish habitat and water quality) capabilities.

This would be accomplished through a rehabilitation and enhancement program similar to that described for Alternative E. This alternative would also implement substantial increases in land allocations to riparian and watershed land allocations.

This alternative is responsive to concerns about riparian areas and watersheds. Eighteen watersheds totalling 112,000 acres would be designated as special emphasis watersheds. About 17,400 acres would be allocated to key site riparian management.

Recreation

A "standard" level of service is to be provided. This is intended to meet the demands of the public in a manner which is responsive to changing desires over time relative to the quality of recreational services and facilities provided. Maintain the ability to supply at least these RVDs through the year 2040:

- Primitive (144,000 RVDs)
- Semi-primitive Nonmotorized (227,000 RVDs)
- Semi-primitive Motorized (2,000 RVDs)
- Roaded Natural (6,658,000 RVDs)
- Roaded Modified (1,481,000 RVDs)
- Rural (1,075,000 RVDs)

Roadless Areas

Timber harvest may occur in all of the areas during the first 10 years except Olallie and Roaring River, where no harvest will occur. All of the areas except Badger Creek and Mt. Hood Additions will be protected.

Communities

This alternative would result in about a 64.7 percent decrease in the total jobs related to timber harvest on the Mt. Hood National Forest. Total recreation related jobs would increase by about 40.4 percent, resulting in a net increase of about 106 jobs over the first decade.

Implementation of this alternative would indirectly benefit urban communities in the Portland metropolitan area because of an increased emphasis on recreation and "amenity" resources. Smaller communities, such as those in the Mt. Hood Corridor, where a large portion of jobs are in recreation and tourism industries, would see an increase in jobs and possibly in overall economic growth. Lifestyles may be affected as outsiders move to the area.

Communities where many people work in the wood products industry, such as Estacada, Molalla, and Maupin, would see large jobs losses in that industry; this may result in out-migration and a loss in stability.

Many rural communities have substantial employment in both wood products and tourism; these communities may be able to capitalize on the growth in recreation to create jobs. This alternative does not present a balanced mix of resource outputs. This lack of balance could intensify conflicts among different Forest users.

This alternative is not very responsive to those communities that are highly dependent on wood products industry jobs. It would provide a level of timber harvest which could support many jobs, but which would be lower than recent levels. Payments to counties would be moderate.

This alternative would also respond well to the needs of those communities where recreation is an important part of the economy. It would provide a high level of recreation, and also protect some of the highest quality recreation opportunities on the Forest, thereby helping the growth of the recreation industry.

Wild, Scenic, and Recreational Rivers

The following rivers were all found eligible for consideration as Wild and Scenic Rivers under the Wild and Scenic Rivers Act. Interim protection of the river corridor and area viewed from the river and major travelways along the river would continue until it is determined that the river is not suitable for inclusion into the national system.

- Middle fork of the Hood River
- A portion of the ZigZag River
- Eagle Creek in Clackamas County
- North Fork of the Clackamas River
- A portion of the South Fork of the Clackamas River
- Fish Creek
- South fork of the Roaring River
- A portion of the Oak Grove Fork of the Clackamas River
- Collawash River
- North Fork of the North Fork of the Breitenbush River

The East Fork of the Hood River was found eligible but would not be recommended for designation under the Wild and Scenic Rivers Act. In the corridor of segment two, Stringer Meadows Special Interest Area would be designated around the wet meadow complex which was the identified outstandingly remarkable value for the river segment. The purpose of the Special Interest Area would be to protect and interpret important meadow values. The remainder of the segment would be in management area A11 and would be open to a range of ski area management activities.

The corridor of segment three would be in management area A7 and would be managed to protect old growth values.

Special Interest Areas

This alternative would designate these Special Interest Areas:

- Barlow Tollgate
- Columbia Gorge Old Wagon Road
- Little Crater Lake
- Little Crater Lake Expansion
- Barlow road
- Larch Mountain
- Roaring River
- Lost Lake
- Bagby Hot Springs
- Sugar Pine
- Parkdale Lava Beds
- Oneonta Gorge
- Cloud Cap-Tilly Jane
- Old Maids Flat
- Clackamas Lake
- Stringer Meadows
- Mill Creek Buttes

Cultural Resources/Native American Uses

Cultural Resources

Required inventories would be completed for timber harvest, road construction and other ground disturbing projects. Cultural sites would be evaluated and mitigated only if threatened by unavoidable impacts or heavy visitor use. Very few sites would be nominated to the National Register and a few would be interpreted for public enrichment, especially very early historic or prehistoric sites. A few historic buildings and structures would be stabilized. Several significant stands of old growth would be designated as Natural Landmarks and interpreted for the public.

Traditional Indian Resources

The availability of traditional huckleberry resources would continue to decline. Deer and elk would increase and fisheries would significantly improve. The quality and quantity of coordination with local tribes would vary depending upon the nature and number of resource projects and activities undertaken. For example, the opening of areas through timber harvest tends to increase opportunities for reestablishing huckleberries and/or improving upon their location and accessibility. Under Alternative H, few such opportunities would exist. The increased number of wildlife and riparian projects, however, would promote long term coordination with local tribes concerned with deer, elk, fisheries, related plant habitats, and water quality.

Alternative I

Alternative I at a Glance

Description	Value
Allowable Sale Quantity (ASQ) in the 1st decade (MMBF)	165
Allowable Sale Quantity (ASQ) in the 1st decade (MMCF)	27.5
Payments to counties (1st decade annual average, MM$)	6.1
Jobs dependent on the Forest (% change, 1st decade)	02.0
Existing old growth remaining after 50 years	271,500
Acres of potential old growth including ingrowth after 50 years	500,300
Acres of spotted owl habitat after 50 years*	498,000
Viewshed acres managed as natural appearing or slightly altered	207,400
Number of roadless areas maintained as unroaded	10
Acres managed to meet riparian objectives	604,700
Big game habitat capability index after 50 years	37,600
Percent of SPNM demand to be met in the 5th decade	25%
Wilderness acres	195,050

**This total does not reflect the recruitment through aging of younger stands.*

Alternative I is developed primarily to provide for fish and wildlife habitat needs. In all areas considered important for fish and wildlife habitat, stocking objectives would be achieved by precluding timber harvest, extending rotations or otherwise modifying timber management practices. The needs of animal species which require open areas would be met by continued timber harvest elsewhere on the Forest. All unroaded areas would be kept free of roads to provide the security for wildlife as well as opportunities for recreation in an unroaded setting and for future wilderness designation. The retention of natural appearing landscapes throughout the Forest would be emphasized.

Timber Supply

Harvest only in areas where timber these harvests will not conflict with other resource objectives. Use intensive management practices such as planting and thinning where it is economically efficient to do so. Offer an allowable sale quantity of 165 mmbf/year

Old Growth

Old growth ecosystems needed to provide a good range of wildlife habitats would be allocated for that purpose. Other old growth stands would be allocated for recreation, scenic, and timber uses.

Scenic Quality

Assure that at least 27 of the Forest's 46 most sensitive viewsheds do not appear more than slightly altered in 50 years.

Wildlife

Deer and Elk

Under this alternative standards and guidelines for deer and elk winter range would be incorporated, as well as additional management protection provided through land allocations B10 and B11, and C2. Implementation of this alternative would result in a stable population of deer and elk.

Other Management Indicator Species

This alternative would meet the management requirements (MRs) for pileated woodpecker and pine marten. Management would consist of 96 MR areas for pileated woodpecker and 231 MR areas for pine marten (600 acres and 320 acres, respectively).

Standards and guidelines for turkey and squirrel would be incorporated under this alternative. Management emphasis and a specific land allocation (B4) would be provided on the east side of the Forest for approximately half of the turkey and squirrel range.

Lands allocated to the C2 management area would provide additional protection for some management indicator species.

Threatened and Endangered Species

Under this alternative, 72 management areas would be maintained, each containing 1875 acres of suitable spotted owl habitat.

Bald eagle habitat areas would be provided under this alternative (land allocation A13).

Fish Habitat and Water Quality

Provide for substantial, long-term increases in Forestwide riparian resource (fish habitat and water quality) capabilities.

This would be accomplished through a rehabilitation and enhancement program similar to that described for Alternative E. This alternative would also implement substantial increases in land allocations to riparian and watershed land allocations.

This alternative is responsive to concerns about riparian areas and watersheds. Eighteen watersheds totalling 112,000 acres would be designated as special emphasis watersheds. About 17,400 acres would be allocated to key site riparian management.

Recreation

A "standard" level of service is to be provided. This is intended to meet the demands of the public in a manner which is responsive to changing desires over time relative to the quality of recreational services and facilities provided. Maintain the ability to supply at least these RVDs through the year 2040:

- Primitive (151,000 RVDs)
- Semi-primitive Nonmotorized (333,000 RVDs)
- Semi-primitive Motorized (9,000 RVDs)
- Roaded Natural (7,450,000 RVDs)
- Roaded Modified (251,000 RVDs)
- Rural (806,000 RVDs)

Roadless Areas

Timber harvest may occur in all of the areas in the first 10 years except Olallie, where no harvest will occur. Recommend the Olallie area for wilderness designation. The roadless character of all the areas except Badger Creek will be maintained.

Communities

This alternative would result in about a 46.1 percent decrease in the total jobs related to timber harvest on the Mt. Hood National Forest. Total recreation related jobs would increase by about 24.3 percent, resulting in a net decrease of about 211 jobs over the first decade.

Implementation of this alternative would indirectly benefit urban communities in the Portland metropolitan area because of an increased emphasis on recreation and "amenity" resources. Smaller communities, such as those in the Mt. Hood Corridor, where a large portion of jobs are in recreation and tourism industries, could see an increase in jobs. Lifestyles may be affected as outsiders move to the area.

Communities where many people work in the wood products industry, such as Estacada, Molalla, and Maupin, would see jobs lost in that industry; this may result in out-migration and a loss in stability.

Many rural communities have substantial employment in both wood products an tourism; these communities may be able to capitalize on the growth in recreation to create jobs. This alternative focuses on wildlife and other "amenity" outputs; this could intensify conflicts among folks interested in management of the Forest.

This alternative is not very responsive to those communities that are highly dependent on wood products industry jobs. It would provide a level of timber harvest which could support jobs, but which would be much lower than recent levels. Payments to counties would be fairly moderate.

This alternative would respond somewhat to the needs of those communities where recreation is an important part of the economy. It would provide a moderate level of recreation. Some areas would be open for recreation, but others would be used primarily for wildlife and fish habitat, and would be restricted for recreation use.

Wild, Scenic, and Recreational Rivers

The following rivers were all found eligible for consideration as Wild and Scenic Rivers under the Wild and Scenic Rivers Act. Interim protection of the river corridor and area viewed from the river and major travelways along the river would continue until it is determined that the river is not suitable for inclusion into the national system.

- Middle fork of the Hood River
- A portion of the ZigZag River
- Eagle Creek in Clackamas County
- North Fork of the Clackamas River
- A portion of the South Fork of the Clackamas River
- Fish Creek
- South fork of the Roaring River
- A portion of the Oak Grove Fork of the Clackamas River
- Collawash River
- North Fork of the North Fork of the Breitenbush River

The East Fork of the Hood River would be recommended for designation under the Wild and Scenic Rivers Act. The proposed classification is:

Segment Number	Classification	Miles	Segment
2	Scenic	1.5	Umbrella Falls to State Highway 35 below Sahalie Falls
3	Recreational	13.4	State Highway 35 below Sahalie Falls to Forest Boundary

Special Interest Areas

This alternative would designate these Special Interest Areas:

- Barlow Tollgate
- Columbia Gorge Old Wagon Road
- Little Crater Lake
- Little Crater Lake Expansion
- Barlow Road
- Larch Mountain
- Roaring River
- Lost Lake
- Bagby Hot Springs
- Sugar Pine
- Squaw Meadows
- Parkdale Lava Beds
- Oneonta Gorge
- Cloud Cap-Tilly Jane
- Old Maids Flat
- Clackamas Lake

Cultural Resources/Native American Resources

Cultural Resources

Required inventories would be completed for ground disturbing projects. Cultural sites would be evaluated and mitigated only if threatened by unavoidable impacts or heavy visitor use. A few sites would be monitored. Several sites would be interpreted for public enjoyment and enrichment, and a few would be nominated to the National Register.

Traditional Indian Resources

The availability of traditional resources would tend to dimish from current supplies, except for wildlife and fisheries which would improve dramatically. The quality and quantity of coordination with local tribes would vary depending upon the nature and number of resource projects and activities undertaken. For example, the opening of areas through timber harvest tends to increase opportunities for reestablishing huckleberries and/or improving upon their location and accessibility. Under Alternative I, few such opportunities would exist. The increased number of riparian projects, however, would promote long term coordination with local tribes concerned with deer, elk, fisheries, related plant habitats, and water quality.

Alternative Q (Preferred Alternative)

Alternative Q at a Glance

Description	Value
Allowable Sale Quantity (ASQ) in the 1st decade (MMBF)	189
Allowable Sale Quantity (ASQ) in the 1st decade (MMCF)	31.9
Payments to counties (1st decade annual average, MM$)	6.8
Jobs dependent on the Forest (% change, 1st decade)	9.3
Existing old growth remaining after 50 years	254,600
Acres of potential old growth including in-growth after 50 years	475,100
Acres of spotted owl habitat after 50 years*	483,000
Viewshed acres managed as natural appearing or slightly altered	334,200
Number of roadless areas maintained as unroaded	6
Acres managed to meet riparian objectives	590,750
Big game habitat capability index after 50 years	36,100
Percent of SPNM demand to be met in the 5th decade	18%
Wilderness acres	186,200

**This total does not reflect recruitment through aging of younger stands.*

Hairy woodpecker.

This is the Forest Service preferred alternative It is a new alternative and was not displayed in the draft EIS. Beginning with the draft EIS preferred alternative (E), alternative Q was developed to respond to public comment and new information. This alternative reflects more recently identified needs to reduce timber harvest levels on some portions of the Forest in response to the public issues of water quality, fish and wildlife. It also emphasizes the values of particular scenic corridors. Recreation of all kinds would be available and its quality would meet public demands. Timber harvest would often be used to help achieve other Forest objectives.

Timber Supply

Produce as much timber as possible on C1 lands. Generally, use intensive practices such as planting and thinning where economically efficient to do so. Produce timber in accordance with other resource objectives on B lands. Offer an allowable sale quantity of 189 mmbf/year.

Old Growth

Some old growth in special interest areas, roadless areas, and other small areas would be set aside from regulated harvest.

Scenic Quality

Assure that at least 34 of the Forest's 46 most sensitive viewsheds do not appear more than slightly altered in 50 years.

Wildlife

Deer and Elk

Under this alternative standards and guidelines for deer and elk winter range would be incorporated, as well as additional management protection provided through land allocations B10 and B11. This alternative would produce a stable and continual population of deer and elk across the Forest. A moderate per square mile deer and elk density would be managed for. Some critical summer and winter range would be identified for intensive management.

Other Management Indicator Species

This alternative would meet the management requirements (MRs) for pileated woodpecker and pine marten. Management would consist of 96 MR areas for pileated woodpecker and 231 MR areas for pine marten.

Standards and guidelines for turkey and squirrel would be incorporated under this alternative Management emphasis and a specific land allocation (B4) would be provided on the east side of the Forest for approximately half of the turkey and squirrel range.

Threatened and Endangered Species

Under this alternative, spotted owl management as defined in the preferred alternative of the Final Supplemental Environmental Impact Statement to the Pacific Northwest Regional Guide would be implemented. Sixty-six management areas would be maintained, each containing 1,500 acres of suitable spotted owl habitat.

Bald eagle habitat areas would be provided under this alternative (land allocation A13).

Only the minimum protection of habitat as required by the Threatened and Endangered Species Act would be the minimum protection for the other threatened and endangered species present of the Forest.

Fish Habitat and Water Quality

Provide for substantial, long-term increases in Forestwide riparian resource (fish habitat and water quality) capabilities.

This would be accomplished through a rehabilitation and enhancement program similar to that described for Alternative E. This alternative would also implement substantial increases in land allocations to riparian and watershed land allocations.

This alternative is responsive to concerns about riparian areas and watersheds. Eighteen watersheds totalling 112,000 acres would be designated as special emphasis watersheds. About 17,400 acres would be allocated to key site riparian management.

Recreation

A "standard" level of service is to be provided. This is intended to meet the demands of the public in a manner which is responsive to changing desires over time relative to the quality of recreational services and facilities provided. Maintain the ability to supply at least these RVDs through the year 2040:

- Primitive (144,000 RVDs)
- Semi-primitive Nonmotorized (27,000 RVDs)
- Semi-primitive Motorized (27,000 RVDs)
- Roaded Natural (5,037,000 RVDs)
- Roaded Modified (2,381,000 RVDs)
- Rural (909,000 RVDs)

Roadless Areas

Timber may be harvested in parts of the Badger Creek, Salmon-Huckleberry, Wind Creek, Bull of the Woods, Mt. Hood Additions, Lake, Eagle, Roaring River, Larch, and Twin Lakes areas in the first decade. Timber harvest will not occur in the Olallie area. The roadless character of Lake, Larch, Olallie, Twin Lakes, Wind Creek, and Eagle will be protected.

Communities

This alternative would result in about a 38.2 percent decrease in the total jobs related to timber harvest on the Mt. Hood National Forest. Total recreation related jobs would increase by about 37.4 percent, resulting in a net increase of about 964 jobs over the first decade.

Implementation of this alternative would indirectly benefit urban communities in the Portland metropolitan area because of an increased emphasis on recreation and "amenity" resources. Smaller communities, such as those in the Mt. Hood Corridor, where a large portion of jobs are in recreation and tourism industries, would see an increase in jobs and possibly in overall economic growth. Lifestyles may be affected as outsiders move to the area.

Communities where many people work in the wood products industry, such as Estacada, Molalla, and Maupin, would see jobs lost in that industry; this may result in out-migration and a loss in stability.

Many rural communities have substantial employment in both wood products and tourism; these communities may be able to capitalize on the growth in recreation to create jobs. This alternative presents a balanced mix of resource outputs. This balance should help communities and local governments plan for their futures.

This alternative responds somewhat to those communities that are highly dependent on wood products industry jobs. It would provide a level of timber harvest which could support many jobs, but which would be lower than recent levels. Payments to counties would be moderately high.

This alternative would respond fairly well to the needs of those communities where recreation is an important part of the economy. It would provide a high level of recreation, and also protect some of the highest quality recreation opportunities on the Forest, thereby helping the growth of the recreation industry.

Wild, Scenic and Recreational Rivers

The following rivers were all found eligible for consideration as Wild and Scenic Rivers under the Wild and Scenic Rivers Act. Interim protection of the river corridor and area viewed from the river and major travelways along the river would continue until it is determined that the river is not suitable for inclusion into the national system.

- Middle fork of the Hood River
- A portion of the ZigZag River
- Eagle Creek in Clackamas County
- North Fork of the Clackamas River
- A portion of the South Fork of the Clackamas River
- Fish Creek
- South fork of the Roaring River
- A portion of the Oak Grove Fork of the Clackamas River
- Collawash River
- North Fork of the North Fork of the Breitenbush River

The East Fork of the Hood River was found eligible but would not be recommended for designation under the Wild and Scenic Rivers Act. In the corridor of segment two, Stringer Meadows Special Interest Area would be designated around the wet meadow complex which was the identified outstandingly remarkable value for the river segment. The purpose of the Special Interest Area would be to protect and interpret important meadow values. The remainder of the segment would be in management area A11 and would be open to a range of ski area management activities.

The corridor in segment three would be in management area B2 and B9 and thus would be managed for scenic qualities and enhancement of wildlife values.

Special Interest Areas

This alternative would designate these Special Interest Areas:

- Barlow Tollgate
- Columbia Gorge Old Wagon Road
- Little Crater Lake
- Little Crater Lake Expansion
- Olallie Lake
- Olallie Lake Expansion
- Barlow Road
- Larch Mountain
- Roaring River
- Lost Lake
- Bagby Hot Springs
- Sugar Pine
- Squaw Meadows
- Parkdale Lava Beds
- Oneonta Gorge
- Cloud Cap-Tilly Jane
- Old Maids Flat
- Clackamas Lake
- Stringer Meadows

Cultural Resources/Native American Uses

Cultural Resources

Required inventories would be completed for timber harvest, road construction and other ground disturbing projects. Some inventories would be conducted in heavy use areas of wild and scenic river corridors and wilderness. Cultural resources would be protected by project avoidance although evaluations and mitigations would be conducted more regularly, especially in areas of heavy visitor use. A few thematic evaluations and National Register nominations would be completed as part of interpretive planning. A few sites would be excavated to mitigated visitor impacts and enhance public awareness. Several historic buildings and structures would be stabilized and interpreted. Several sites would be regularly monitored.

Traditional Indian Resources

The availability of certain traditional resources, like huckleberries, would tend to decline in some areas and improve in others. Wildlife, fisheries and other plant resources would become more abundant. The quality and quantity of coordination with local tribes would vary depending upon the nature and number of resource projects and activities undertaken. For example, the opening of areas through timber harvest tends to increase opportunities for reestablishing huckleberries and/or improving upon their location and accessibility. Under Alternative Q, such opportunities would exist as would numerous opportunities for increased long term coordination with local tribes concerned with deer, elk, fisheries, related plant habitats, and water quality.

Comparison of Alternatives

This section presents the alternatives in a way that they can be easily compared. Aspects presented for comparison include:

- Responsiveness to Issues and Concerns
- Assignment of Land to Management Areas
- Management of Forest Resource Programs
- Resource Outputs
- Environmental Effects
- Costs and Benefits

In addition to tables, narrative sections describe differences between alternatives

No mathematical formula can define the preferred alternative Indeed, there are differences of opinion about particular effects of alternatives. Therefore, major effects of each alternative must be the basis for review, judgement, and eventual selection.

The following pages summarize outputs and effects that differ significantly among alternatives. Outputs and effects projected for each alternative are based on the assumption that ASQ for each year will be harvested. Table II-27 summarizes quantitative outputs; Table III-28 summarizes qualitative outputs.

Response to Issues

Table II-2 shows how alternative respond to the issues. For each alternative, information in the table portrays how each issue is resolved.

Management Areas

As explained earlier in this chapter, a primary means of meeting the objectives of an alternative is to assign specific geographic areas of the Forest to be managed in accordance with selected standards. This process is referred to as "allocating acres to management areas." Management area allocations are shown on the alternative maps and the supplementary wildlife resource map accompanying this document.

The management areas developed by the Forest are grouped into five categories according to the type and degree of planned development for each area. These categories, labeled A, B, C, D, and E represent broad differences in the use, intensity and objectives for each area. These categories are described on the following pages. For more information on management areas, see Chapter 4 of the Forest Plan.

Table II-3 shows how acres are allocated to management areas by alternative.

One of the eight alternatives considered in detail, Alternative NC, is based on management area designations which predate the management area development process. Alternative NC represents the Mt. Hood National Forest Timber Management Plan, which received final administrative approval on Feb. 22, 1978. The term "Streamside Management Unit" used in that Plan is similar to the "Key Site Riparian Habitat" term used in this FEIS. Other management area acre designations are harder to discern in the Ten Year Management Plan. For this reason, acreage estimates shown in this FEIS related to Alternative NC are less accurate than those shown for the other seven alternatives

Table II-2 Comparison of Issue and Concern Response

Issue/Outputs/Effects	Alternative							
	NC	A	C	E	F	H	I	Q (Preferred)
Intensity								
Full Yield (Suitable) (M Acres)	444	316	397	271	121	102	12	162
Reduced Yield (Suitable) (M Acres)	124	119	89	156	219	121	329	230
Unsuitable, No Harvest, Or Minimum Level (M Acres)	495	628	577	636	723	840	722	671
Total (M Acres)	1,063	1,063	1,063	1,063	1,063	1,063	1,063	1,063
Timber Supply								
Average Annual, First Decade (ASQ) (MMCF/Yr)	313	235	282	317	154	108	165	189
Timber Sale Program Quantity (MMBF/Yr)	357	268	321	361	176	123	188	215
Long-Term Sustained Yield Capacity (MMCF)	51.6	38.9	46.4	37.6	25.8	18.1	27.5	31.9
Old Growth (M Acres)								
Status of Existing Old Growth								
Current Level	345.3	345.3	345.3	345.3	345.3	345.3	345.3	345.3
1st Decade	302.1	312.7	307.7	300.8	323.7	330.2	322.6	320.6
2nd Decade	261.1	281.8	272.4	284.8	303.3	318.5	301.7	299.7
5th Decade	185.6	225.0	205.5	223.9	262.0	290.1	271.5	254.6
Potential Old Growth (Includes estimate of In-Growth)								
1st Decade	302.1	312.7	307.7	300.8	323.7	330.2	322.6	320.8
2nd Decade	335.5	356.1	346.8	359.1	377.7	392.8	375.9	373.3
5th Decade	400.8	443.7	422.3	429.6	493.1	523.3	500.3	475.1
Fish Habitat and Water Quality								
Aquatic Habitat Stability Index								
1st Decade	4.0	6.0	4.4	5.9	7.1	7.9	7.4	6.7
2nd Decade	4.0	6.0	4.5	5.9	7.0	8.3	7.4	6.7
5th Decade	3.6	5.9	4.4	5.5	7.4	8.7	8.1	6.7
Acres that meet riparian objectives	308,950	473,750	374,275	517,250	577,350	768,650	604,700	590,750
Spotted Owls and Other MIS (Potential Number of Animals)								
Pileated Woodpecker								
1st Decade	267	272	269	267	278	280	277	275
2nd Decade	250	259	252	250	268	274	267	263
5th Decade	199	219	206	212	242	256	238	231

Table II- 2 Comparison of Issue and Concern Response (continued)

Issue/Outputs/Effects	Alternative							
	NC	A	C	E	F	H	I	Q (Preferred)
Spotted Owl								
1st Decade	166	171	167	167	173	175	173	173
2nd Decade	157	160	157	155	167	173	167	164
5th Decade	124	137	128	131	151	194	149	144
Pine Marten								
1st Decade	588	598	591	588	609	615	608	604
2nd Decade	552	571	559	553	590	601	588	579
5th Decade)	452	492	492	477	537	565	530	513
Turkey								
1st Decade	2,200	2,200	2,000	3,800	4,600	3,800	5,400	4,100
2nd Decade	3,800	3,300	3,000	4,900	5,800	5,500	6,500	5,600
5th Decade	4,000	3,200	2,900	4,850	5,900	5,400	6,400	5,500
Squirrel								
1st Decade	2,200	2,200	2,000	3,800	4,600	3,800	5,400	4,100
2nd Decade	4,180	3,300	2,800	5,320	7,360	6,080	7,000	6,700
5th Decade	5,060	3,200	2,700	5,300	7,500	6,000	6,900	6,500
Elk								
1st Decade	4,900	5,100	4,900	6,500	6,700	7,100	7,350	7,300
2nd Decade	3,900	4,700	4,500	6,300	6,100	6,300	6,900	6,900
5th Decade	4,100	4,900	4,700	6,300	6,500	6,900	7,900	7,300
Deer								
1st Decade	17,400	18,300	17,400	24,100	24,900	27,400	28,200	28,200
2nd Decade	13,300	16,600	15,800	23,300	22,400	23,300	26,600	26,600
5th Decade	14,100	17,400	16,600	23,300	24,100	26,600	30,700	28,200
Conflicts Between Recreation and Other Uses[1]								
Supply of Dispersed Recreation (ROS Class) (MRVDs/Yr)								
1st Decade	9,698	9,350	9,705	9,160	8,374	9,587	8,993	8,746
2nd Decade	9,698	9,350	9,705	9,160	8,374	9,587	8,993	8,746
5th Decade	9,698	9,350	9,705	9,160	8,374	9,587	8,993	8,746

[1] *Includes Wilderness Use Capacity.*

Table II- 2 Comparison of Issue and Concern Response (continued)

Issue/Outputs/Effects	Alternative							
	NC	A	C	E	F	H	I	Q (Preferred)
Supply of Developed Recreation Site Opportunities								
Supply of Developed Recreation (MRVDs/Yr)								
1st Decade	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000
2nd Decade	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000
5th Decade	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000
Wild and Scenic Rivers								
Designated Rivers								
Number	5	5	5	5	5	5	5	5
Miles	120.7	120.7	120.7	120.7	120.7	120.7	120.7	120.7
Acres	39,038	39,038	39,038	39,038	39,038	39,038	39,038	39,038
Eligible Rivers[1]								
Number	0	10	10	10	10	10	10	10
Miles	0	89.7	89.7	89.7	89.7	89.7	89.7	89.7
Acres	0	28,926	28,926	28,926	28,926	28,926	28,926	28,926
East Fork Hood River[2]								
Miles Scenic	0	0	0	0	0	0	1.5	0
Acres Scenic	0	0	0	0	0	0	524	0
Miles Recreational	0	0	0	0	14.9	0	13.4	0
Acres Recreational	0	0	0	0	4,668	0	4,144	0
Maintenance and Enhancement of Scenic Quality								
The number of the Forest's 46 most sensitive viewsheds that will be naturally appearing after 50 years.	6	7	1	8	15	21	10	12
The number of the Forest's 46 most sensitive viewsheds that will be appearing slightly altered after 50 years.	6	5	1	13	25	21	17	22

[1] *Does not include E. Fork Hood River. It is considered seperately.*

[2] *Miles and Acres Recommended for National Designation by Classification.*

Table II-2 Comparison of Issue and Concern Response (continued)

Issue/Outputs/Effects	Alternative							
	NC	A	C	E	F	H	I	Q (Preferred)
Disposition of Remaining Roadless Areas								
The number of unroaded areas that are unroaded and unharvested after 50 years.								
1st Decade	3	3	2	3	9	9	10	6
2nd Decade	3	3	2	3	9	9	10	6
5th Decade	3	3	2	3	9	9	10	6
The acreages of unroaded areas that are unroaded and unharvested after 50 years.								
1st Decade	57,010	57,360	34,260	67,600	109,190	111,480	113,820	81,130
2nd Decade	57,010	57,360	34,260	67,600	109,190	111,480	113,820	81,130
5th Decade	57,010	57,360	34,260	67,600	109,190	111,480	113,820	81,130
Communities								
Average Annual Payments to Counties (MM$ 1982)	11.4	8.4	10.4	10.8	5.4	3.8	5.8	6.4
Change in Total Jobs	2,906	1,452	1,977	2,561	461	106	-211	964
Economic Values (MM$)								
Total Cash Flow, Average								
1st Decade	2.7	-3.1	0.5	11.4	-11.7	-16.3	-4.8	-9.7
5th Decade	25.4	13.0	17.2	12.5	2.3	-7.6	15.3	9.1
Present Net Values (MM$)	1,227.6	910.6	1,106.8	971.0	596.4	405.5	613.7	676.3

Table II-3 Management Area Acres by Alternative

Management Areas	Alternative							
	NC (No Change)	A (No Action)	C (RPA)	E (Draft Preferred)	F	H	I	Q (Preferred)
A-2[1] Wilderness	186,200	186,200	186,200	186,200	186,200	186,200	195,050	186,200
A-3 Research Natural Areas	1,150	1,150	1,150	1,150	1,150	1,150	1,150	1,150
A-4 Special Interest Areas	29,550	29,550	25	36,500	40,550	30,300	31,550	38,800
A-5 Unroaded Recreation	850	0	0	7,100	48,000	15,850	52,250	16,550
A-6 Semi-Primitive Roaded Recreation	0	0	0	2,600	7,850	0	2,000	5,000
A-7 Old Growth	0	0	0	0	2,000	263,200	10,700	2,000
A-8 Spotted Owl	0	52,650	52,650	52,650	52,650	86,750	86,750	66,050
A-9 Key Site Riparian	0	10,400	11,550	14,500	14,700	14,700	14,000	14,700
A-10 Developed Recreation	650	650	1,700	650	1,700	1,700	1,700	1,700
A-11 Winter Recreation	7,250	7,250	7,600	7,600	9,400	8,950	5,800	11,700
A-12 Outdoor Education	100	100	100	100	100	100	100	100
A-13 Bald Eagle	700	0	0	0	50	700	700	700
Subtotal A	226,450	287,950	260,975	309,050	364,350	609,600	401,750	344,650
B-1 Wild, Scenic, & Rec. Rivers	33,550	18,350	18,100	17,100	15,950	7,750	13,950	13,650
B-2 Scenic Viewshed	160,700	108,100	0	92,650	184,900	69,350	8,600	113,650
B-3 Roaded Recreation	0	0	0	1,550	17,200	0	0	9,650
B-4 Pine Oak Habitat	0	0	0	10,050	15,700	10,850	21,300	11,550
B-5 Pileated Woodpecker/Pine Marten Habitat	0	49,850	51,050	47,450	43,300	19,300	39,400	44,950
B-6 Special Emphasis Watershed	0	0	0	30,200	46,150	30,100	37,800	78,600
B-7 General Riparian	0	103,650	107,150	96,200	87,950	50,700	83,750	91,550
B-8 Earthflow	0	0	0	17,800	0	11,600	16,650	25,800
B-9 Wildlife Visual	0	0	0	3,900	0	0	52,700	3,750
B-10 Winter Range	0	0	0	0	3,900	7,450	71,450	8,700
B-11 Summer Range	0	0	0	0	2,250	5,000	191,225	5,150
B-12 Backcountry Lakes	0	0	0	0	3,900	0	0	3,900
Subtotal B	194,250	279,950	176,300	316,900	421,200	212,100	536,825	410,900
C-1 Timber Emphasis Subtotal C	517,875	370,675	501,300	312,625	153,025	116,875	0	183,025
DA1 Bull Run Drainage	59,925	39,600	0	39,800	39,225	38,425	38,425	38,025
DA2 North Buffer	1,450	1,450	1,450	1,450	1,450	1,450	1,450	1,450
DA3 Research Natural Areas	6,500	4,400	4,400	4,400	4,400	4,400	4,400	4,400
DA8 Spotted Owl	0	11,900	11,900	11,900	11,900	12,950	12,950	13,300
DA9 Key Site Riparian	0	1,050	800	1,350	1,350	1,100	1,100	1,050
DA13 Bald Eagle	75	0	0	0	75	75	75	75
DB2 Scenic Viewshed	1,500	950	0	0	950	950	950	950

Table II-3 Management Area Acres by Alternative (continued)

Management Areas	Alternative							
	NC (No Change)	A (No Action)	C (RPA)	E (Draft Preferred)	F	H	I	Q (Preferred)
DB5 Pileated Woodpecker/Pine Marten Habitat	0	6,850	6,850	6,850	6,850	6,850	6,850	6,850
DB7 General Riparian	0	10,800	10,800	10,800	10,800	10,800	10,800	10,800
DB8 Earthflow	300	50	0	0	50	50	50	50
DC1 Timber Emphasis	21,250	13,950	54,800	14,450	13,950	13,950	13,950	14,050
Subtotal D[2]	91,000	91,000	91,000	91,000	91,000	91,000	91,000	91,000
EA1 Scenic	31,050	16,400	16,400	16,400	16,300	15,100	15,100	15,500
EA4 Special Interest	75	75	75	75	75	75	75	75
EA8 Spotted Owl	0	9,800	9,800	9,800	9,800	12,550	12,550	10,550
EA9 Key Site Riparian	0	250	250	250	250	200	200	250
EA12 Outdoor Education	300	300	300	300	300	300	300	300
EA13 Bald Eagle	150	0	0	0	100	150	150	150
EB2 Scenic Viewshed	2,300	1,300	1,300	1,300	1,300	1,300	1,300	1,300
EB5 Pileated Woodpecker/Pine Marten	0	2,050	2,050	2,050	2,050	900	900	2,050
EB7 General Riparian	0	3,700	3,700	3,700	3,700	3,300	3,300	3,700
Subtotal E	33,875	33,875	33,875	33,875	33,875	33,875	33,875	33,875
Total	1,063,450	1,063,450	1,063,450	1,063,450	1,063,450	1,063,450	1,063,450	1,063,450

[1] *An additional 700 acres of non-federal land occurs within the boundaries of existing Wilderness.*

All alternatives except NC propose three research natural areas within Wilderness boundaries. The acreage for those RNAs is reflected in allocations A3 and DA3.

[2] *An additional 4,400 acres of non-federal land occurs in the Bull Run.*

Category A

Management activities in category A management areas are designed to meet specific resource objectives other than timber production and often are designed to result in near natural conditions over time.

These areas have no regulated timber harvest. Timber salvage operations may be permitted under certain conditions or restrictions. However, the total amount of salvage volume from areas A3 through A12 is not expected to exceed 1 MMBF/year under any of the alternatives considered in detail.

Category B

Management objectives in category B management areas are designed to achieve specific non-timber resource objectives while also promoting a healthy, growing forest through management for timber.

In order to achieve the stated resource management objectives for specific management areas in this category and to meet ASQ goals, regulated timber harvest shall be scheduled in Category B management areas. These timber harvest levels are based on capability and suitability of the land in accordance with applicable laws and regulations. Compared to Category C management areas, these management areas have additional restrictions regarding rate of harvest, sizes of openings, and minimum rotations: i.e. how old a timber stand is before it is harvested.

Category C

There is only one Category C Management Area, designated as area C1. Regulated timber harvest is scheduled in this area as a dominant objective, while other outputs would be jointly produced. Management activities in area C1 are designed primarily to provide wood products and a healthy, growing forest mosaic through timber harvest. These objectives are achieved while concurrently being sensitive to, and managing for, the other forest resource uses and values including transitory forage production and public recreation use. Timber harvest levels are based on capability and suitability of the land in accordance with applicable laws and regulations. These include restrictions on the size and spacing of timber harvest units, as well as strict adherence to the Standards and Guidelines (see Chapter 4 of the Forest Plan).

Category D

This category is used for lands within the Bull Run Watershed Planning Unit. Generally, these lands are managed with the same intent as the corresponding A, B, and C allocations. For example, DA3 management intention is the same as A3. Refer to the standards and guidelines in Chapter 4 of the Forest Plan for specific management direction. These allocations were assigned to follow the direction in the current Bull Run Planning Unit Management Plan.

Category E

This category is used for lands within the boundaries of both the Columbia River Gorge National Scenic Area and the Mt. Hood National Forest. Generally, these lands are managed with the same intent as the corresponding A, B, and C allocations. Refer to the standards and guidelines in Chapter 4 of the Forest Plan for specific management direction. These allocations were assigned in close consultation with the Scenic Area staff to correspond to their forthcoming management plan.

Category A

Management Area A-2 - Wilderness

The primary goal for this management area is to promote, perpetuate and preserve the wilderness character of the lands, protect watersheds and wildlife habitat, preserve scenic and historic resources and promote scientific research, and primitive recreation.

This management area type includes five entire, Congressionally designated wilderness areas on the Forest, i.e. Mt. Hood, Bull of the Woods, Salmon-Huckleberry, Badger Creek, and Columbia. A portion of the Mt. Jefferson Wilderness is also included.

Management Area A-3 - Research Natural Area

The primary goal is to preserve examples of ecosystems in a modified condition for research and education. Research natural areas serve as a baseline for comparison with ecosystems that have been altered through human activity. They also serve as a gene pool reserve for plant and animal species, particularly threatened, endangered and sensitive species.

The areas are located throughout the Forest, filling the needs identified by the Research Natural Area System.

Management Area A-4 - Special Interest Area

The primary goal is to protect and, where appropriate, foster public recreation use and enjoyment of important historic, cultural and natural aspects of our national heritage. An additional goal is to preserve and provide interpretations of unique geological, biological and cultural areas. These management areas range from several acres to several thousand acres and are scattered across the Forest.

Management Area A-5 - Unroaded Recreation

The primary goal is to provide a variety of year-round unroaded recreation opportunities in an undeveloped forest environment. The management areas are located throughout the Forest and are generally accessed by trails.

Management Area A-6 - Semi Primitive Roaded Recreation

The primary goal is to provide year-round dispersed motorized recreation opportunities in a natural appearing environment.

These areas are located throughout the Forest, often in steep, rugged sub-alpine terrain. They are typically accessed by primitive roads and trails.

Management Area A-7 - Special Old Growth

The primary goal is to provide the many significant values of old growth forests for present and future generations and to provide for a relatively high degree of interaction between people and old growth. They provide wildlife and plant habitat ecosystem diversity and preservation of aesthetic qualities. Old growth forest areas are also included in other MA's such as Spotted Owl Habitat Areas (A8) and Wilderness (A2).

These management areas are scattered throughout the Forest.

Management Area A-8 - Northern Spotted Owl Habitat Area

The primary goal is to protect and manage old growth/mature forest habitat well distributed across the Forest for maintaining a viable population of Northern Spotted Owls.

These areas typically, large, contiguous blocks of habitat are dispersed throughout the Forest, generally below 4,000 feet elevation. The Final Supplemental Environmental Impact Statement to the Pacific Northwest Regional Guide (December, 1988) defines the minimum sizes, distribution and habitat characteristics.

Management Area A-9 - Key Site Riparian

The primary goal of this MA is to maintain or improve habitat and hydrologic conditions of selected riparian areas. These selected areas are noted for their diversity, high natural quality and key role in the continued production of riparian dependent resources.

This management area type is generally associated with streams, lakes, and wetlands. The designation includes the riparian and aquatic ecosystem and the upland transition zone.

Management Area A-10 - Developed Recreation Sites

The primary goal is to provide a range of quality outdoor recreational opportunities for concentrated recreation use at readily accessible, developed sites. These sites include summer home tracts, (near the Town of Rhododendron), campgrounds, organization camps, trailheads, picnic grounds, etc.

These management areas range in size from less than one acre to hundreds of acres and are scattered across the Forest.

Young spotted owl.

Management Area A-11 - Winter Recreation Area

The primary goal is to provide areas for quality winter recreation opportunities including: downhill skiing, Nordic skiing, snowmobiling and snow play, within a natural appearing forest environment.

These areas are located in the high elevation, winter snow zone, near Mt. Hood.

Management Area A-12 - Outdoor Education Area

The primary goal is to provide opportunities for outdoor public education programs, environmental education, interpretive work and other general learning activities for groups which focus on the natural and cultural history of the Forest.

These areas are specific sites set aside for outdoor education purposes.

Management Area A-13 - Bald Eagle Habitat Area

The primary goal is to protect and manage bald eagle nesting and winter/communal roost areas. A secondary goal is to maintain a mature and overmature stand condition.

Bald eagles do not currently nest on the Mt. Hood National Forest. However, nine general recovery territories were identified on the Forest in the Pacific Bald Eagle Recovery Plan (U.S. Fish and Wildlife Service, 1986). Within these nine general territories, 26 Bald Eagle Habitat Areas have been identified by the Mt. Hood National Forest. These Management Areas have specific habitat types associated with bald eagles. They are generally near bodies of water with substantial food sources and include forest stands with large trees capable of supporting eagle nests.

Category B

Management Area B-1 - Designated Wild, Scenic and Recreational Rivers

This management area's primary goal is to protect and maintain the "outstandingly remarkable" resource values for which the rivers and river segments were designated as Wild and Scenic Rivers. The specific goals for wild, scenic and recreational classified river segments are:

Wild: Perpetuate a primitive recreational experience and protect the river corridor to maintain an essentially unmodified environment.

Scenic: Maintain or enhance quality scenery and protect an essentially undeveloped character of shoreline.

Recreational: Provide opportunities for recreational activities and maintain visual quality of the river corridors.

The management area is presently identified as a corridor approximately one-quarter mile along each side of the designated rivers.

Management Area B-2 - Scenic Viewsheds

The primary goal is to provide Forest visitors with attractive scenery.

These management areas include landscapes that are seen from major travel routes, rivers and lakes, major viewpoints and popular recreation areas.

Management Area B-3 - Roaded Recreation

The primary goal is to provide a variety of year-round dispersed recreation opportunities in a natural appearing roaded setting. A secondary goal is to provide for a variety of timber management practices.

These areas are located in roaded natural settings. They are typically accessed by improved forest roads and trails.

Management Area B-4 - Pine Oak Habitat Area

The primary goal is to maintain valuable deer and elk habitat with additional emphasis on nesting and forage production for year-round turkey and gray squirrel habitat. Secondary goals are to provide for a variety of timber management practices and to provide summer recreation opportunities.

This area is on the far eastern fringe of the Forest on the drier southerly exposures.

Management Area B-5 - Pileated Woodpecker/Pine Marten Habitat Area

The primary goal is to provide mature/old growth forest habitat to sustain reproductive pairs of pileated woodpecker and pine marten Forestwide

These areas are distributed on a grid system across the Forest with pileated woodpecker areas 5 miles apart and pine marten areas 2 miles apart. Pileated woodpecker areas and pine marten areas are approximately 600 acres and 320 acres in size, respectively.

Management Area B-6 - Special Emphasis Watershed

The primary goal is to maintain or improve watershed, riparian, and aquatic habitat conditions, as well as, water quality for municipal uses and/or long term fish production. A secondary goal is to provide for a variety of timber management practices. Special Emphasis Watersheds are located throughout the Forest.

Management Area B-7 - General Riparian Area

The primary goal is to achieve and maintain riparian and aquatic habitat conditions for dependent resources, e.g. fish, wildlife, and sensitive plants and high quality water. A secondary goal is to provide for a variety of timber management practices.

These areas occur within other designated management areas and are determined by field investigation. They are not individually mapped on the alternative maps.

Management Area B-8 - Earthflow Area

The primary goal is to maintain hydrologic and physical balances to prevent reactivation or acceleration of earthflow areas. An additional goal is to allow for the management and utilization of forest resources through the use of special management practices.

Most earthflow areas are located on the west side of the Forest, primarily in the Clackamas River drainage.

Management Area B-9 - Wildlife Visual Area

The primary goal is to provide quality rearing habitat for elk, deer and other wildlife species while supplying Forest visitors with views of natural appearing landscape features, including meadows, lakes and valleys.

These areas encompass lands valuable both as key wildlife habitat and as viewsheds from primary Forest roads, e.g. Hwy. 35.

Management Area B-10 - Deer and Elk Winter Range

The primary goal is to provide high quality habitat for deer and elk use during winter periods, therefore helping to provide for stable populations of Mule Deer and Rocky Mountain Elk on the east side of the Forest and Blacktail Deer and Roosevelt Elk on the west side. The secondary goal is to provide for a variety of timber management practices.

These management areas are generally found below 2800 feet on the west side and 3000 feet on the east side.

Management Area B-11 - Deer and Elk Summer Range

The primary goal is to provide high quality deer and elk habitat for use during the summer. A secondary goal is to provide for a variety of timber management practices. These areas are typically located at higher elevations and are often associated with wetlands or riparian areas.

Management Area B-12 - Back Country Lakes

The primary goal is to protect or enhance the recreation, fish and wildlife, and scenic values of selected lakes. A secondary goal is to provide for a variety of timber management practices.

These lakes are scattered throughout the Forest and are found outside of wilderness and special interest management areas. They may or may not have road access.

Category C

Management Area C-1 - Timber Emphasis

The primary goal is to produce timber and other forest products on a regulated basis, based on the capability and suitability of the land, while also protecting and enhancing other resource uses and values.

These management areas are scattered across the Forest, ranging in size from less than 200 acres to thousands of acres. Some of these lands have inclusions of other management areas such as General Riparian Areas and Pileated Woodpecker/Pine Marten Habitat which have reduced harvest levels.

Category D

Management Area D - Bull Run Watershed Management Unit

The primary goal of this management area is to serve as the main water supply for the City of Portland, with principal objective of producing pure, clear, raw potable water of a quantity and quality that is at least as good as that historically produced. A secondary goal is the protection, management and utilization of renewable resources found within the management unit.

This designation applies to lands established as the Bull Run Watershed Management Unit (Public Law 95-200 and Portland City Council Resolution 31832). The Bull Run Watershed Management Unit encompasses approximately 95,400 acres.

Land use allocations identified in the Bull Run Final Environmental Statement are incorporated into the Forest Plan through the following designations. The designations have in addition to the primary goal of protecting the water supply, secondary goals similar to those listed in the A, B and C categories with the added restriction of no public entry. For example, the management direction for the A3 Management Area is the same as the DA3 Management Area.

DA1 - Bull Run Physical Drainage

Watershed Management emphasis with no regulated timber harvests.

DA2 - North Buffer - No regulated harvest.

No regulated harvest, adjacent to Columbia Wilderness, approximately 1,360 acres in the headwater of Eagle and Tanner Creeks.

DA3 - Research Natural Area

Includes existing and proposed areas, approximately 5,920 acres. The two Management Areas are Big Bend Mountain and Bull Run Lake.

DA8 - Northern Spotted Owl Habitat Area

DA9 - Key Site Riparian

DA13 - Bald Eagle Habitat Area

DB2 - Scenic Viewshed

Located in the North Buffer and visible from the Larch Mountain area, approximately 1,130 acres.

DB5 - Pileated Woodpecker/Pine Marten Habitat Area

DB7 - General Riparian Area

These areas are not located on the map, but are designated during field investigation and are located throughout the Bull Run Management Unit.

DB8 - Earthflow Area

One management area has been located in the west buffer.

DC1 - Timber Emphasis

Located in the South and North Buffers, approximately 23,500 acres.

Category E

Management Area E - Columbia Gorge National Scenic Area

The primary goal for this management area is to protect and provide for the enhancement of the scenic, cultural, recreational and natural resources of the Columbia River Gorge and to protect and support the economy of the Columbia River Gorge area.

This portion of the Forest included in the Columbia River Gorge National Scenic Area, stretches an approximate two mile wide strip along the Columbia River across the entire northern Forest boundary.

The following management area designations in Category E lands generally correspond and are similar to goals listed in the A, B and C categories. For example, EA8 management area is the same as A8 management area, except that it is located within the National Scenic Area.

EA1 - Scenic Area

EA4 - Special Interest Area

EA8 - Northern Spotted Owl Habitat Area

EA9 - Key Site Riparian

EA10 - Developed Recreation

EA12 - Outdoor Education Area

EA13 - Bald Eagle Habitat Area

EB2 - Scenic Viewshed

Non-regulated timber harvest may occur

EB5 - Pileated Woodpecker/Pine Marten Habitat Area

No timber harvest is projected

EB7 - General Riparian Area

No timber harvest is projected

Forest Resource Programs

This section describes the outputs that would be produced under different alternatives. Significant effects are also presented. The purpose of this section is to highlight the most important variations among alternatives.

Goals and objectives for Forest resource programs are included in the discussion of management areas in the Forest Plan, Chapter 4. See Chapter IV of the Final EIS for a discussion of the environmental consequences of each alternative.

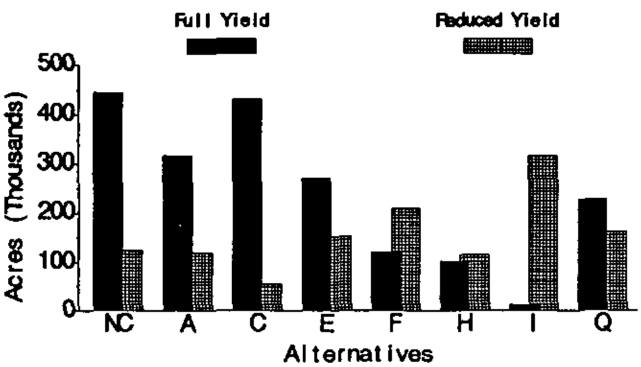
Timber

Land Allocations

A major difference among alternatives is the amount of land managed for timber production. This is shown in Figure II-2. Alternatives that emphasize timber production, such as NC, A, and C, tend to have a greater percentage of land allocated to full yield timber production. Alternatives which emphasize production of many resources, such as Alternatives E and Q, have land allocated to many uses, including full yield timber production, partial yield timber production, and many recreation and wildlife habitat uses. Other alternatives emphasize resources other than timber; land in these alternatives is allocated accordingly.

Timber resource inventory and management data are presented in Table II-4. This table is followed by discussions of land suitability for timber production, ASQ, TSPQ, and LTSYC.

Figure II-2 Suitable Forest Lands Managed for Timber Production by Alternative



Timber Outputs

Timber outputs are calculated in cubic feet (CF) and then converted to board feet (BF) using factors derived from the historical data. Cubic foot volume represents the total amount of wood in a tree stem from stump height to a specified top diameter. The board foot measure is a hold-over from early methods of scaling large logs and does not accurately portray the amount of usable wood in smaller logs. Cubic measure more accurately represents wood volume than the traditional board foot method, so it is used for harvest scheduling and control.

As the average size of trees harvested over the next few decades decreases, the board foot measure will present much less reliable estimates of growth or harvest volumes. The ASQ and Total Sale Program Quantity (TSPQ) are displayed in both cubic feet and board feet to help ease the transition to exclusive use of the cubic measure over the next few years.

Several techniques are used to measure the amount of timber that the Forest would produce under the different alternatives. These include long-term sustained yield capacity, allowable sale quantity, and total sale program quantity. Several different timber production figures are presented because the level of timber supply on the Forest is an important issue.

Comparison of Past, Present and Projected Future Timber Outputs

In the 1970s, industry did not cut all of the timber it purchased. Timber sales were purchased at relatively high prices, and the price for lumber products was low during the same period. An economic recession and high interest rates contributed to this disparity. The trend has reversed in the 1980s. For the last five years, the amount of timber harvested has exceeded the amount that has been sold. The average annual timber production on the Mt. Hood National Forest between 1979 and 1988 was 368.5 million board feet, including 305.7 million board feet chargeable volume and 62.7 nonchargeable volume. In 1989, the Forest sold or offered about 196 million board feet, and in 1990 it offered 281 million board feet. For more information about historical timber production on the Mt. Hood National Forest, refer to Chapter III of this document.

Alternatives A through Q reflect NFMA, Management Requirements (MRs), and the latest assessment of land suitability for timber production. Alternative NC uses the same assessment of land suitability used in the 1979 Timber Management Plan, and does not include MRs. Differences among the alternatives are primarily due to the amount of land managed for timber production and the intensity of management prescribed. Alternative I, for example, devotes very little land to full yield timber production while Alternative C manages for full yield on most of the lands where it allows timber harvest. Both factors influence the ability of the alternatives to supply timber products.

The timber program in 1989 and 1990 was very tumultuous. The Mt. Hood National Forest, among others, was enjoined from selling many of the timber sales it had planned for 1989. Section 318 of the Interior and Related Agencies Appropriations Act for 1990 provided a two-year target, and part of the volume not sold in 1989 was eventually sold in 1990.

Long-Term Sustained Yield Capacity

Long-term Sustained Yield Capacity (LTSYC) for each alternative is a prediction of the maximum timber volume that could be harvested from lands managed for timber production every year indefinitely. Differences in LTSYC between alternatives reflect both the amount of area managed for timber and the kind of timber management prescribed. Table II-6 shows the LTSYC of each alternative.

Table II-4 Timber Resource Management Information

	Benchmark		Alternative							
	Max. Timber Bench-mark	Max. PNV Bench-mark	NC	A	C	E	F	H	I	Q (Preferred)
Suitable Lands	500	500	568	435	486	427	340	223	341	392
Tentatively Suitable Lands	678	678	678	678	678	678	678	678	678	678
Inventory										
Begin MMCF	3,460	3,460	3,970	2,916	3,316	2,860	2,202	1,311	2,164	2,620
Begin MCF/Acre	6.92	6.92	6.99	6.70	6.84	6.76	6.67	6.04	6.59	6.75
End MMCF	2,701	2,741	3,349	2,480	2,705	2,260	2,085	1,197	1,965	2,385
ASQ										
MMCF	48.8	48.8	51.6	38.9	46.4	53.4	25.8	18.1	27.5	31.9
% of Beginning Inventory	1.4	1.4	1.3	1.3	1.4	1.9	1.2	1.4	1.3	1.2
MMBF	272	299	313	235	282	317	154	108	165	189
LTSYC										
MMCF	48.8	48.8	51.6	38.9	46.4	37.6	25.8	18.1	27.5	31.9
% of Ending Inventory	1.8	1.8	1.5	1.6	1.7	1.7	1.2	1.5	1.4	1.3
Decade Met	1	1	1	1	1	5	1	1	1	1
Net Growth										
Present CF/Acres	60	60	60	60	60	57	61	60	62	61
2030 CF/Acre	68	68	72	73	74	75	79	82	77	76
2030 MMCF	34.2	34.2	40.7	31.8	35.7	31.8	26.1	17.8	25.1	29.5
Yield Level (M Acres)										
Full Yield	500	500	444	316	397	271	121	102	12	162
Percent	100	100	78	73	89	64	37	47	4	58
Reduced Yield	0	0	124	119	89	156	219	121	329	230
Percent	0	0	22	27	11	36	63	53	96	42
1st Decade Harvest (M Acres)										
Regeneration Harvest[1]	42	42	43	33	40	45	22	15	23	29

[1] *Includes clearcut, shelterwood cut, single tree selection cut, and group selection cut.*

Table II-5 Comparison of Past, Present, and Alternative Timber Outputs

Outputs	Unit of Measure	1979-1988 Average	1989	1990	Alternative							
					NC	A	C	E	F	H	I	Q (Preferred)
I. Allowable Sale Quantity (ASQ) - The allowable sale quantity is composed of those volumes resulting from the yield projections of FORPLAN. ASQ is obtained from lands designated as suitable for timber production under NFMA standards, and meets the utilization standards in the Regional Guide. When sold, the volume is called "chargeable," and is used to determine achievement of planned allowable sale quantity goals.												
A.Green	MMBF	305.7	174.6	199.0	313	235	282	317	154	108	165	189
B.Salvage		NE[1]	21.1	82.1	NE	NE	NE	NE	NE	NE	NE	NE
Total Allowable Sale Quantity I.		305.7	195.7	281.1	313	235	282	317	154	108	165	189
II. Other Sawtimber - Meets utilization standards in Regional Guide, but is not considered "chargeable" against the planned sale quantity goals.												
A. Sawtimber from lands designated unsuitable for timber production - this volume is estimated based on the incidental volume of timber that will be sold from lands that are not designated for timber production.												
1. Green	MMBF	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
2. Salvage		NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
B. Dead sawtimber from lands that are designated suitable for timber production, but which were not included in yield tables.												
	MMBF	NE	6.8	9.8	11	8	9	11	6	4	6	6
Total Other Sawtimber		NE	6.8	9.8	11	8	9	11	6	4	6	6
III. Submerchantable Volume from All Lands - The estimated timber volume that does not meet the utilization standards in the Regional Guide, but which could be utilized for products other than sawtimber. It is not considered "chargeable" against planned allowable sale quantity goals.												
A. Fuelwood		NE	3	4	6	5	6	6	3	2	3	4
B. Other		NE	27.1	24.4	27	20	24	27	13	9	14	16
Total Submerchantable Volume		NE	30.1	28.4	33	25	30	33	16	11	17	20
Total Net Merchantable Sawtimber (I + II)		305.7	195.7	281.1	313	235	282	317	154	108	165	189
Total Nonchargeable (II + III)	MMBF	62.8	36.9	38.2	44	33	39	44	22	15	23	26
Timber Sale Program Quantity (I + II + III) - The timber sale program quantity includes the allowable sale quantity for the first decade and estimated additional volume planned for sale during the first decade, such as fuelwood.												
Total	MMBF	368.5	232.6	319.3	357	268	321	361	176	123	188	215

[1] *NE = Not Estimated. This volume is the result of unpredicatable events such as windstorms, wildfire, or other unforseen circumstances necessary to protect adjacent resources; and therefore, cannot be projected in advance.*

[2] *The assumptions that were used in the existing timber management plan to calculate potential yield differ from those that were used to calculate Allowable Sale Quantity. While potential yield represented a level that could be produced, allowable sale quantity represents a timber objective and program for achievement of planned levels. However, both the potential yield and allowable sale quantity do represent a ceiling on the amount of chargeable timber volume that could be sold for a given decade. In this context, the two terms are comparable.*

Table II-6 Long Term Sustained Yield Capacity by Alternative

Outputs	Unit of Measure	Alternative							
		NC	A	C	E	F	H	I	Q (Preferred)
LTSYC	MCF	51.6	38.9	46.4	37.6	25.8	18.1	27.5	31.9

The LTSYC of each alternative is most influenced by the number of acres managed for timber production. Alternatives with a higher LTSYC have more acres managed for timber production and more of those acres would be managed at a higher intensity level on shorter rotations.

LTSYC for Alternative NC is much higher than for other alternatives because:

- Alternative NC has more acres available for timber management, and
- More intensive management of younger stands results in higher yields from every acre.

LTSYC and ASQ are the same unless an alternative specifies departure from non-declining flow. (See the discussion of departure in this chapter and the glossary for more information on departure.) Alternatives in the draft EIS which called for departure from non-declining flow have been revised or are no longer being considered in detail. The exception is Alternative E, which does have a departure timber sale schedule.

Allowable Sale Quantity

The Allowable Sale Quantity (ASQ) is the average amount of wood to be sold every year from the land base where timber harvest is allowed. It consists of live, sound trees that meet required utilization standards. They will be harvested through regeneration, commercial thinning, and salvage harvests. Salvaged dead trees are not included in the ASQ, but an estimate of this amount is shown below under Timber Sale Program Quantity (TSPQ).

The relationship between the number of board feet and the number of cubic feet (called the board foot/cubic foot ratio) has been updated. For more information, refer to Appendix B. ASQ amounts are calculated in cubic feet so this update has no effect on the actual amount of wood harvested in each alternative.

Only Alternative E changes rank from fourth on the basis of LTSYC to first in ASQ. Alternative E is the only one still calling for departure. The others hold their relative position in LTSYC, ASQ, and TSPQ.

Timber Sale Program Quantity (TSPQ)

The Timber Sale Program Quantity (TSPQ) is the total volume of timber projected for sale. It includes an estimate of submerchantable, salvage, non-chargeable green timber and miscellaneous products as well as the calculated ASQ. This number gives an idea of the true volume of wood products that would actually be removed from the Forest under different alternatives. The TSPQ amount by alternative is shown in Table II-7 and II-8.

In all alternatives except departure alternative E, LTSYC and ASQ are identical, but both are higher than net growth for more than 50 years, and probably will remain so for two or more lifetimes. Growth is accelerating for the first five decades, as shown in Figure II-2.

Eventually growth will rise to equal LTSYC and ASQ as slow-growing forests are replaced with fast-growing new ones.

Figure II-3 illustrates the relationship of the timber outputs to the productive capacity of the Forest:

Species Offered for Sale

The alternatives would offer different mixes of species for sale because their management areas span different ecological zones. The ecological zones have a great deal of species variability among them. This is discussed in more detail in the section on the vegetative inventory in Chapter III of the Final EIS.

These differences are not vast and they show continuing emphasis on Douglas-fir, currently the most commercially useful and valuable species.

Rotation Lengths

The time between one regeneration harvest and the next on the same piece of ground is called a rotation.

Table II-7 Timber Sale Program Quantity by Alternative (MMCF)

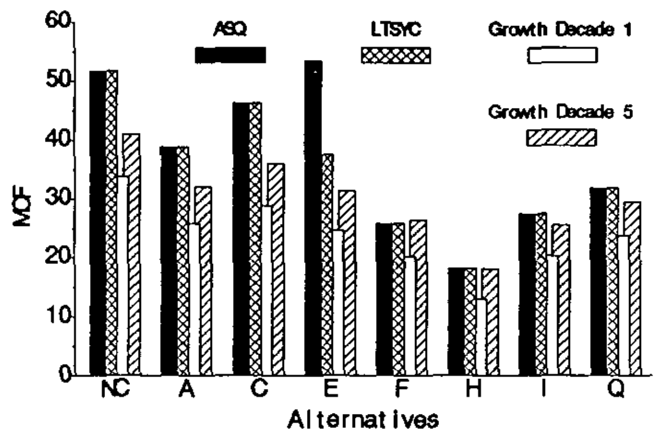
Outputs	Unit of Measure	Alternative NC	A	C	E	F	H	I	Q (Preferred)
First Decade									
ASQ Green	MMCF/ Year	51.6	38.9	46.4	53.4	25.8	18.1	27.5	31.9
Other		7.2	5.4	6.5	7.5	3.6	2.5	3.8	4.5
TSPQ		58.8	44.3	52.9	60.9	29.4	20.6	31.3	36.4
Second Decade									
ASQ Green	MMCF/ Year	51.6	38.9	46.4	40.1	25.8	18.1	27.5	31.9
Other		7.2	5.4	6.5	5.6	3.6	2.5	3.8	4.5
TSPQ		58.8	44.3	52.9	45.7	29.4	20.6	31.3	36.4
Fifth Decade									
ASQ Green	MMCF/ Year	51.6	38.9	46.4	37.6	25.8	18.1	27.5	31.9
Other		7.2	5.4	6.5	5.3	3.6	2.5	3.8	4.5
TSPQ		58.8	44.3	52.9	42.9	29.4	20.6	31.3	36.4

Table II-8 Timber Sale Program Quantity by Alternative (MMBF)

Outputs	Unit of Measure	Alternative NC	A	C	E	F	H	I	Q (Preferred)
First Decade									
ASQ Green	MMBF/Year	313	235	282	317	154	108	165	189
Other		44	33	39	44	22	15	23	26
TSPQ		357	268	321	361	176	123	188	215

One way to set the length of a rotation is to calculate the maximum average annual growth rate -- called the culmination of mean annual increment (CMAI). MAI declines after culmination due to the offsetting effects of disease and mortality, but individual trees and total stand volume continue to grow.

Figure II-3 Long Term Sustained Yield Capacity (LTSYC), Allowable Sale quantity - First Decade; Growth-First and Fifth Decades



Rotation length can also be set by working from a specific objective, such as the size of tree wanted or the amount of cutting to occur at the same time. In this sense, rotation length is a powerful management tool.

Alternatives that specify a special tree size or limits on area cut tend to have longer rotations. Alternatives seeking to maximize annual harvest or present net value (PNV), such as Alternatives NC, A, and C tend to have shorter rotations. The average rotation length of each alternative would depend on the proportion of lands managed for the various objectives. Table II-9 shows these differences by alternatives.

Silvicultural Practices

Table II-10 shows amounts of land to be treated with seven different silvicultural practices in the first, second, and fifth decades. Differences among alternatives would be due to amounts of land harvested rather than the mix of treatments. The area expected to be treated with a regeneration harvest is related to timber harvest levels. All lands that are harvested will be reforested.

Competing and Unwanted Vegetation

The Pacific Northwest Region has completed a Final Environmental Impact Statement on Managing Competing and Unwanted Vegetation. All alternatives would comply with the Record of Decision for the FEIS issued by the Regional Forester in December 1988 and the mediated agreement of August 1989.

All vegetation management tools are permitted under the terms of that decision, while herbicide is to be used only when other methods are ineffective. The overall emphasis is to reduce reliance on herbicides by preventing vegetation management problems, and using low-risk alternative methods when possible.

Herbicides are rarely used for silvicultural purposes on the Mt. Hood National Forest. There are no plans underway to activate a vegetation management program with herbicides.

Old Growth

The Mt. Hood National Forest has about 345,000 acres of old growth. (For an in-depth discussion of this issue, please see the sections on old growth in Chapter III and

Table II-9 Average Rotation Length by Alternative

Management Areas	Unit of Measure	Alternative							
		NC	A	C	E	F	H	I	Q (Preferred)
C	Years	125	126	125	125	122	112	74	124
Average of B	Years	232	222	188	223	240	221	178	228
Forest Average	Years	149	153	133	178	197	170	174	185

Table II-10 Silvicultural Practices[1] for Decades 1, 2 and 5 by Alternative

Outputs	Unit of Measure	Alternative							
		NC	A	C	E	F	H	I	Q (Preferred)
First Decade									
Regen. Harvest [2]	M Acres	43	33	40	45	22	15	23	29
Comm. Thin	M Acres	0	0	0	0	0	0	0	0
Precomm. Thin	M Acres	27	23	26	23	21	17	20	22
Fertilization	M Acres	0	0	0	0	0	0	0	0
Second Decade									
Regen. Harvest	M Acres	41	31	37	37	21	16	22	28
Comm. Thin	M Acres	0	0	0	0	0	0	0	0
Precomm. Thin	M Acres	30	26	29	31	23	18	25	27
Fertilization	M Acres	0	0	0	0	16	0	0	0
Fifth Decade									
Regen. Harvest	M Acres	41	31	38	26	19	14	17	24
Comm. Thin	M Acres	29	25	29	24	19	17	19	22
Precomm. Thin	M Acres	38	29	34	30	22	15	20	24
Fertilization	M Acres	29	24	28	24	19	14	19	21

[1] *Refer to Appendix I for a discussion on silvicultural practices.*

[2] *Includes clearcut, shelterwood cut, single-tree selection cut, group selection cut.*

Chapter IV.) A major difference among alternatives lies in how much old growth is harvested, and also how much harvest comes from mature natural stands.

Although some old growth will be harvested, many acres in natural mature stands are set aside in wilderness areas, and other management areas where timber harvest is not permitted. These stands will never be harvested under the terms of the alternatives. This will allow many mature natural stands that do not now meet the criteria for old growth to develop requisite attributes during the next five decades.

Change and renewal is the one essential element of all living systems. The assumption that old-growth qualities will develop as mature natural stands age is much safer than the reverse premise that stands are not dynamic and do not change at all. Trees and ecosystems, even the most ancient ones, must eventually be renewed through the force of time.

In management areas where timber harvest is permitted, many mature natural stands will develop old-growth attributes before five decades has passed. Although these stands will eventually be harvested over the very long term (Table II-9 shows the average rotation length by alternative), they will continue to develop old growth attributes as time goes by, until harvested. The amount of existing old growth plus the area expected to acquire old growth attributes is termed potential old growth including ingrowth.

Managed stands will take the place of old growth soon after harvest. With deliberate management far into the future, some qualities of old growth, such as structural attributes important for certain habitat, may be recovered. Many generations will pass before it is known how well old growth conditions can be emulated in the managed forest.

The Mt. Hood National Forest has over 240,000 acres of mature forest old enough to make the transition into the old growth category within fifty years. In the presence of modern fire mangement strategies and techniques, it is likely nearly all will survive that long, except that which is harvested.

Table II-11 shows the estimated amount of existing old growth that will remain in fifty years. The total amount including in-growth is also shown. In spite of the recruitment of old growth attributes through mature stands coming into the old growth class during the first five decades, the proportion of old growth, including that occurring on unsuitable lands, declines on the Management Areas where harvest is permitted. For Alternative NC, the amount of old growth allocated to lands that allow timber management activities decreases from a current level of 187,700 acres to 131,200 acres at the end of five decades. For Alternative H, which attempts to maximize the total amount of old growth, the acres decrease from 55,900 to 35,000.

When in-growth on all forested lands is considered, in every alternative the proportion of potential old growth actually goes up in the first five decades. The main reason for this is a substantial acreage of mature natural stands which are expected to assume old growth character within that period. Most of these mature natural stands will never be harvested because they are in Management Areas where harvest is not permitted. Figures II-4 and II-5 illustrate the overall trends in old growth. Table II-11 shows the projected acreages.

Figure II-4 Existing Old Growth Remaining, Decades 1,2 and 5

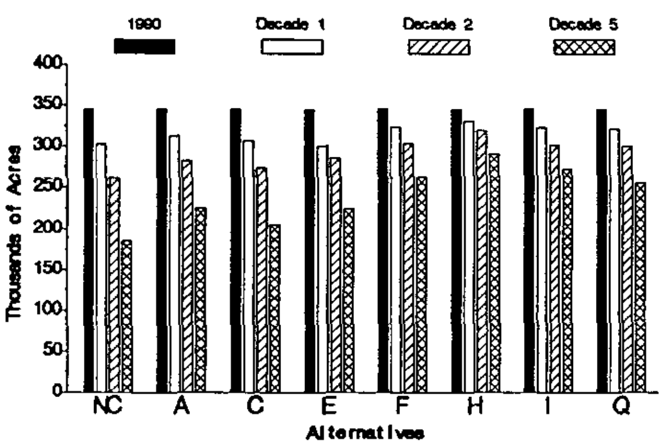
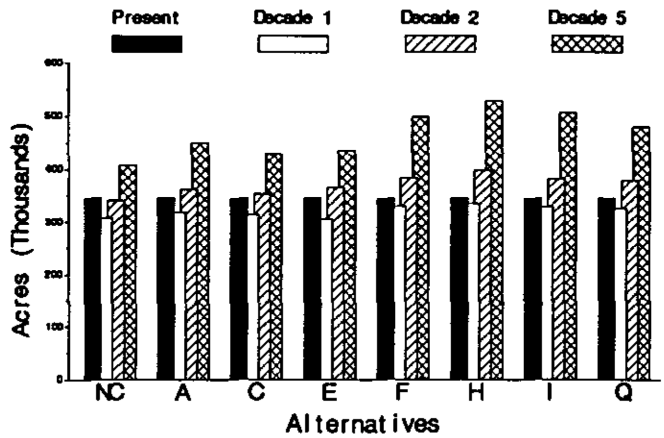


Figure II-5 Acres of Potential Old Growth after One, Two and Five Decades



Forestry Program for Oregon

In accordance with 36 CFR 219.7, plans and policies of other Federal, State, and local governments and Indian Tribes must be considered in the land management planning process. The Forestry Program for Oregon (FPFO) represents the State of Oregon's objectives for management of forestlands within the State. The current FPFO, adopted January 3, 1990, by the Oregon Board of Forestry, is significantly different than the FPFO analyzed in the draft EIS. The FPFO (1982) assessed in the draft EIS included timber outputs assigned to the various categories of landowners required to accomplish the coordinated programs contained in the FPFO. The volume figures previously provided to the national forests, including the Mt. Hood National Forest, are no longer part of the FPFO.

The current FPFO focuses on intent rather than on specific numbers and reflects a broader interest in all forest uses and resources instead of focusing on timber production.

The following summarizes the objectives of the Forestry Program for Oregon and discussion of it's consideration in the Final Environmental Impact Statement for the Forest Plan.

Table II-11 Amount of Old Growth, Decades 1, 2, and 5

Decade	Unit of Measure	Alternative							
		NC	A	C	E	F	H	I	Q (Preferred)
All Lands - Existing Old Growth Remaining	M Acres 1990	345.3	345.3	345.3	345.3	345.3	345.3	345.3	345.3
1	M Acres	302.1	312.7	307.7	300.8	323.7	330.2	322.6	320.6
2	M Acres	261.1	281.8	272.4	284.8	303.3	318.5	301.7	299.7
5	M Acres	185.6	225.0	205.5	223.9	262.0	290.1	271.5	254.6
All Lands - Potential[1] Old Growth Including In-growth or Accretion of Old Growth Attributes	M Acres 1990	345.3	345.3	345.3	345.3	345.3	345.3	345.3	345.3
1	M Acres	302.1	312.7	307.7	300.8	323.6	330.2	322.6	320.6
2	M Acres	335.5	356.1	346.8	359.1	377.7	392.8	375.9	373.3
5	M Acres	400.8	443.7	422.3	429.6	493.1	523.3	500.3	475.1
Harvest Permitted	M Acres 1990	187.7	134.0	153.3	131.7	103.6	55.9	98.4	122.0
1	M Acres	144.5	101.4	113.7	87.2	81.9	40.8	75.7	97.3
2	M Acres	137.7	97.2	107.4	97.8	79.7	39.7	73.3	99.1
5	M Acres	131.2	88.2	93.3	69.8	76.2	35.0	81.6	95.2
Harvest Not Permitted	M Acres 1990	157.6	211.3	194.0	213.6	241.7	289.4	246.9	223.3
1	M Acres	157.6	211.3	194.0	213.6	241.7	289.4	246.9	223.3
2	M Acres	197.8	258.9	239.4	261.3	298.0	353.1	302.6	274.2
5	M Acres	269.6	355.5	328.5	359.8	416.9	488.3	418.7	379.9

[1] *Existing currently, minus amount harvested, plus amount entering class from existing mature natural stands.*

Basic Objective	Discussion
Preserve the forest land base of Oregon and assure practical forest practices that conserve and protect soil productivity and air and water quality by:	
Developing land use recommendations which recognize that forests are dynamic and most forest uses are compatible and which emphasize the integration of forest land use.	The Forest has developed standards and guidelines (chapter 4 of the Forest Plan) designed to integrate forest uses. These standards and guidelines apply to all alternatives.
Encouraging Federal agencies to maintain as large and as stable a commercial forest land base as possible and to minimize future withdrawals from this land base.	Table II-4 summarizes the timber management information for the FEIS. The land base tentatively suitable for timber management is 680,0280 acres. Alternative C devotes a high of 63% of the tentatively suitable land base to full yield timber management. Alternative H is low at only 15% of the suitable land base devoted to full yield management.
Recommending that habitat should be managed based on sound research data and recognizing that forests are dynamic and that most forest uses are compatible over time.	The standards and guidelines for all fish and wildlife habitats are based on the most current knowledge of local and state experts.
Cooperatively establishing forest management standards and regulations for the protection of necessary habitat: these standards and regulations are based on the best knowledge available and are consistent with responsible forest management.	The standards and guidelines for fish and wildlife were coordinated with the Confederated Tribe of Warm Springs, the U.S. Fish and Wildlife Service, and the Oregon Department of Fish and Wildlife.
Promote the maximum level of sustainable timber growth and harvest on all forest lands available for timber production, consistent with applicable laws and regulations, also considering landowner objectives by:	
Promoting timber growth and harvest on public lands in a manner consistent with the governing statutory direction, while seeking to meet Oregon's timber needs through the application of enlightened land and resource management.	The long-term sustained yield is an indicator of the degree in which an alternative attains the total biological potential of timber growth and harvest. Please refer to Table-9.
Supporting the use of intensive timber management practices where those practices are professionally, environmentally, and economically sound.	Figure II-1 and Table IV-30 (Chapter IV, FEIS) shows the management intensity chosen for all acres with a programmed harvest. The intensity chosen optimizes present net worth and meets all alternative resource coordination requirements.

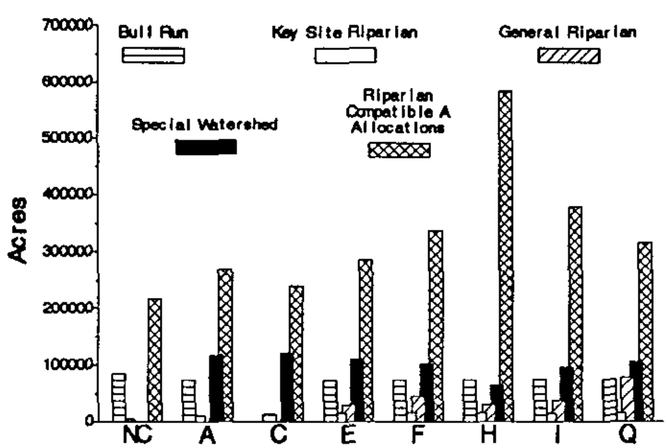
Basic Objective	Discussion
Encourage appropriate opportunities for other forest uses, such as fish and wildlife habitat, grazing, recreation, and scenic values on all forest lands, consistent with landowner objectives by:	
Encouraging a full range of recreational opportunities on both public and private lands consistent with landowner objectives.	Table II-(2) shows how responsive each alternative is in meeting developed recreation site demand, providing a range of recreation opportunity spectrum settings, and managing areas of dispersed recreation.
Promoting adequate funding for the full implementation, operation, and maintenance of forest recreation facilities, including trails and campgrounds on public forestlands allocated for forest recreation.	For all alternatives, recreation captial investments are approximately $3.1 million/year, and trails capital investments are approximately $2.7 million/year. The emphasis is on reconstruction/rehabilitation of facilities to an acceptable level of service. Some new construction also occurs.
Devise and use environmentally sound and economically efficient strategies to protect Oregon's forest from wildlife, insects, disease, and other damaging agents by:	
Encouraging cost-effective Federal fire management policies that emphasize planned ignition fires over natural ignition fires and that consider impacts to the State of Oregon's Forest Fire Protection Program.	It is Forest Service Policy to conduct fire management planning that establishes the most cost-effective funding level for the fire organization. All alternatives provide for the use of planned ignition fires and are part of the cost-effectiveness analysis of the fire organization.
Encouraging the Federal plans which develop and implement fire suppression policies at both the State and national levels be coordinated with the State.	Fire suppression policies are developed at the national and regional levels and are above the scope of the Forest Plan. Suppression activities are coordinated with the local state fire suppression organization.
Promoting the effective use of integrated pest management as a coordinated approach to the selection, integration, and implementation of pest control actions.	Integrated pest management is a forestwide standard and guideline. All activities are approached with integrated pest management as a major consideration. Pest management specialists have been assigned to this Forest and are available for project design and consultation.

Water Resources and Fish Habitat

Water is a resource which is important in many ways. Waterways and the associated riparian zones serve as habitat for many species of fish and other animals. The Mt. Hood National Forest also has several municipal watersheds within its boundaries; water quality in these watersheds is strictly controlled. Important factors in assessing the quality of the water resource on the Forest include quality indicators, such as sedimentation production, temperature, and turbidity, and quantity of water produced.

Figure II-6 shows the total area which is managed for riparian resources by alternative. Fish habitat and water quality are two major riparian resources. Riparian management areas are designed specifically to emphasize proactive management of these resources. A mix of riparian resource allocations and a variety of mitigation measures are used to address water quality concerns. However, the relative degree of management emphasis for fish habitat and water quality varies directly with the total acres managed for the riparian resources displayed below. Alternatives with more acres in riparian management areas tend to respond better to these concerns.

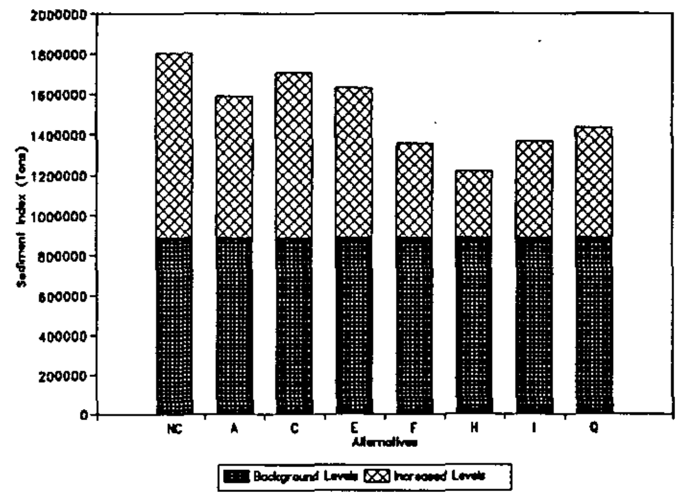
Figure II-6 Acres Managed for Riparian Resources by Alternative

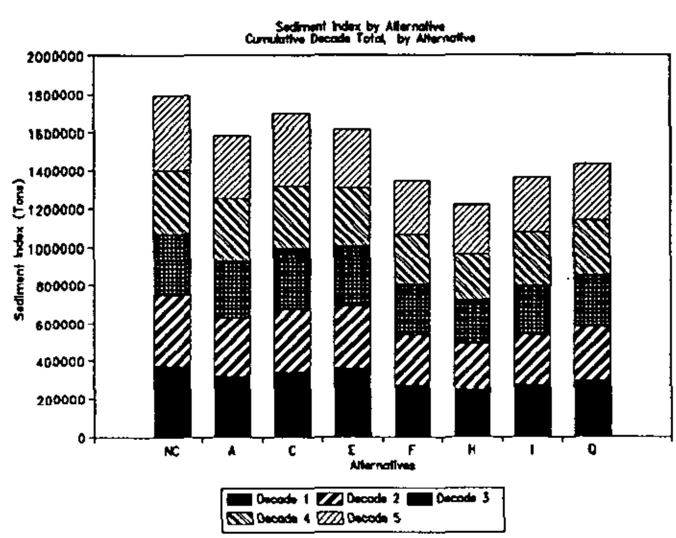


Sediment Production

The amount of accelerated sediment production and its potential risk to the beneficial uses of water including public and domestic supply, irrigation, fisheries, wildlife, recreation, and visual quality varies by alternative. A sediment delivery index is shown, by alternative, in Figure II-7. This indicator serves as a rough measure of the health of a watershed; the lower the index the higher the water quality. Alternative NC has the highest sediment delivery index and would have the greatest risk of violating State of Oregon water quality (turbidity) standards. The other alternatives, in decreasing order of sediment delivery index values, would have lower risk of violating water quality standards.

Figure II-7 Sediment Delivery Index by Alternative After 5 Decades

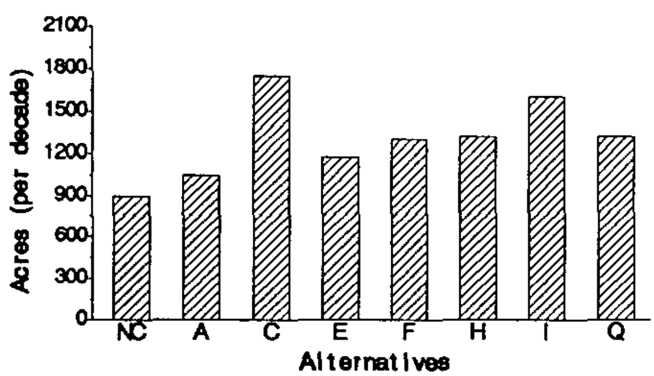




Soil and Watershed Improvement

Another important aspect of water quality on the Forest is the amount of soil and watershed improvement activities. These activities vary by alternative, as shown in Figure II-8. Alternatives that propose a greater rate of timber harvest would tend to result in greater need for, and financing of watershed improvement projects. (Historically, funding for about 60 percent of this work is tied to timber harvest activity and volume of harvest.) Alternatives which emphasize fish, wildlife, and recreation also propose increased levels of watershed improvement work.

Figure II-8 Soil and Watershed Improvement Activities by Alternative



Fish Habitat

Figures IV-9 and IV-10 of the FEIS reflect two indicators of responsiveness of the Forest's alternatives to the fish habitat and water resources issue. These two figures display projections of the aquatic habitat stability index, first averaged for the Forest and then split out for the 15 major subdrainages. This index gauges the stability of the productive capability of aquatic habitat for fish habitat and water quality, given a "normal" level of both natural (windstorms, floods, drought) and management-related (timber harvest, road building) disturbances. This model integrates four variables:

- Sediment delivery to aquatic systems above an estimated background level.
- A weighted total of acres selected for riparian resource management.
- Acres of other land allocations having high compatibility with the objectives of riparian resource management.
- Total acres of trees in the 0 to 30 year age class.

Index scores can range from 0, indicating lowest relative stability conditions, to 10, reflecting highest stability. Alternatives which propose lower levels of timber harvest and road building, or alternatives with relatively larger proportions of land in riparian management areas, would have higher index values.

A more detailed discussion of this model and its projections, limitations, etc. is included in Chapter IV.

Table II-12 presents some of the more significant outputs and indices reflecting productive capability for fish habitat and water quality. The FORPLAN model and/or other analytical techniques were used to derive these estimates. Several are extrapolations from the aquatic habitat stability index. Many of these outputs do not vary by alternative. This is based on the assumption that because of changing alternative emphasis, variable investments for mitigation and rehabilitation will be required to maintain output capability at about present levels for Alternatives A and C. In Alternative NC projections show that investments are insufficient to maintain present output capabilities. In other alternatives, additional acre allocations to riparian resources management areas and variable investments in addition to mitigation and rehabilitation, termed enhancement, are expected to increase selected output capabilities relative to the present.

Comparison with State and Other Agency Fish Objectives

There are a number of plans and policies formulated by other parties with regard to the management of the aquatic habitat. Most of these plans and policies have elements that deal specifically with fish habitats. In general, they address two basic elements of fish habitat:

- The protection and maintenance of existing habitat.
- The restoration, rehabilitation, and/or enhancement of fish habitat.

Five pertinent plans or programs are:

The Columbia River Basin Fish and Wildlife Program, 1984 (Northwest Power Planning Council). This plan was prompted by passage of the Pacific Northwest Electric Power Planning and Conservation Act of 1980 (P.L. 95-501). This plan emphasizes the restoration of Columbia River anadromous fish runs diminished by basin-wide hydroelectric development and operation. Restoration provisions include protecting fish survival,

Table II-12 Outputs Related to the Fish Habitat and Water Quality Issue

Outputs/Effects	Unit	Alternative							
		NC	A	C	E	F	H	I	Q (Preferred)
Fish Use[1]	WFUDs (M)								
1st Decade		289	289	289	289	289	289	289	289
2nd Decade		308	315	303	315	315	315	315	315
5th Decade		383	442	364	444	447	460	454	440
Anadromous Fish[1] Commercial Harvest	M pounds per year								
1st Decade		491	491	491	491	491	491	491	491
2nd Decade		decline	491	491	506	565	590	610	515
5th Decade		decline	491	decline	525	628	641	730	575
Fish Habitat Rehabilitation Mitigation/Improvement	M$/year 1982 $								
1st Decade		572	295	627	185	185	185	185	185
2nd Decade		590	332	664	199	199	199	199	199
5th Decade		590	369	738	221	221	221	221	221
Anadromous Fish Without Major Rehab Program	Smolt Habitat capability Index								
1st Decade		100	100	100	100	100	100	100	100
2nd Decade		80	95	94	96	102	103	102	101
5th Decade		60	90	70	85	110	115	117	103
Anadromous Fish With Major Rehab Program[2]	Smolt Habitat Capability Index								
1st Decade		100	100	100	100	100	100	100	100
2nd Decade		90	100	100	103	115	120	125	105
5th Decade		75	100	95	107	128	135	150	115
Legal Trout Without Major Rehab Program[2]	Legal Trout Index								
1st Decade		100	100	100	100	100	100	100	100
2nd Decade		85	96	95	99	101	102	102	101
5th Decade		70	93	80	98	103	105	104	102

[1] *Assumes thay any alternative would include a rehabilitation program. For an index without rehabilitation work refer to smolt habitat capacity and Legal Trout Indices below.*

[2] *100 is current potential habitat capability of 1,777,000 smolts, and 1,472,000 trout. Index values are shown both with and without a major rehabilitation program. Rehabilitation program funding is shown above. Anadromous fish population trends are relatively slow to react and in general, take a decade to react to management activities.*

Table II-12 Outputs Related to the Fish Habitat and Water Quality Issue (continued)

Outputs/Effects	Unit	Alternative							
		NC	A	C	E	F	H	I	Q (Preferred)
Legal Trout With Major Rehab Program[2]	Legal Trout Index								
1st Decade		100	100	100	100	100	100	100	100
2nd Decade		93	100	100	103	105	105	110	103
5th Decade		80	100	95	103	113	113	123	110
Water Yield	Ave. Annual MAcFt								
1st Decade		5,446	5,446	5,446	5,446	5,446	5,446	5,446	5,446
2nd Decade		5,446	5,446	5,446	5,446	5,446	5,446	5,446	5,446
5th Decade		5,446	5,446	5,446	5,446	5,446	5,446	5,446	5,446
Sediment Index	M Tons/ Decade								
1st Decade		375	318	342	364	272	248	276	289
2nd Decade		375	314	329	324	265	241	262	282
5th Decade		395	334	386	305	284	260	285	298

[2] *100 is current potential habitat capability of 1,777,000 smolts, and 1,472,000 trout. Index values are shown both with and without a major rehabilitation program. Rehabilitation program funding is shown above. Anadromous fish population trends are relatively slow to react and in general, take a decade to react to management activities.*

encouraging their reproduction, and rehabilitating and enhancing their habitats in the Columbia River and its tributaries.

Comprehensive Plan for Production and Management of Oregon's Anadromous Salmon and Trout, 1982 (Oregon Department of Fish and Wildlife). This statewide plan deals with all major anadromous species. Habitat management considerations focus on the maintenance and improvement of anadromous fish habitat.

Oregon Wild Fish Policy, (Oregon Department of Fish and Wildlife). This policy formally recognizes the need for habitat-based, wild, and natural fisheries production.

Willamette Basin Fish Management Plan, 1990 (Oregon Department of Fish and Wildlife). A key feature of this plan is a section that emphasizes the importance of maintaining fish habitat to insure fish populations remain at high levels.

Subbasin Fish Management Plans, for the Clackamas, Sandy, and Hood River systems, 1989 (Oregon Department of Fish and Wildlife). A key feature of these plans is a section that emphasizes the importance of maintaining fish habitat to insure fish populations remain at high levels. These plans are currently being reviewed and approved by the Fish and Wildlife Commission.

All alternatives, except NC and C, indicate general maintenance of the Forest's aquatic habitat and, therefore, appear to be generally consistent with such goals. In Alternative NC, declines in aquatic habitat capability are projected in both short and long-term time periods. Any such decline appears inconsistent with the aforementioned plans/programs.

Proposed rehabilitation and restoration efforts center primarily on maintaining existing production capability levels of the habitat. Alternative C falls into this category. Alternatives E, Q, F, H and I project future increases from current levels in the production capabilities of Forest aquatic habitat. These alternatives are therefore fully consistent with the identified plans and programs. In this group of alternatives, E would produce the least substantial increases.

The Bull Run Watershed

Another aspect of water resource management is the extent to which the Bull Run Watershed will be managed to provide high quality water. In all alternatives except C, the watershed is managed according to direction contained in the Bull Run FEIS, 1979. In Alternative C, however, management emphasis is changed from the production of high quality water, to joint management for both water and timber.

Wildlife

Wildlife habitat is managed in a variety of ways in the alternatives. Timber harvest is prohibited on some lands where certain species require old growth. In other areas, harvest is permitted and wildlife habitat management goals are modified accordingly.

Threatened, Endangered, and Sensitive Species

Northern Spotted Owl

The northern spotted owl is dependent upon well-spaced mature and old growth coniferous forest for insuring long term viability of the species. The owl is listed as a threatened species by the U.S. Fish and Wildlife Service. Owls require multilayered forest stands with large dead, defective, and downed trees for their habitat. Normally this condition occurs late in the natural succession of a timber stand.

Because other species are also dependent upon mature/old growth forest, the northern spotted owl has been identified by the Pacific Northwest Region of the Forest Service as an indicator species, with specific management requirements (MRs) that assure viability of the species. By providing these management requirements for the spotted owl, it is believed the viability of other species also dependent upon mature/old growth forests will also be maintained.

Quantity and distribution of habitat necessary to sustain viable populations of spotted owls and associated species are described in the Supplement to the Pacific Northwest Regional Guide (USDA Forest Service 1984a and 1988a) and other regional direction (Sirmon 1983). Spotted owl management consists of protection of habitat characteristics favored by spotted owls from adverse modification, and restriction of activities that could cause nest abandonment or mortality of young.

For most of the alternatives, the number of Spotted Owl Habitat Areas (SOHAs) and their sizes do not vary, as Table II-14 illustrates. For almost all alternatives, only the minimum protection as required by the Supplement to the Pacific Northwest Regional guide would be maintained, sixty-six SOHAs of 1500 acres each. Alternatives NC and I would protect 72 1,875 acres sites. Alternative NC would provide no management protection for spotted owls.

Table II-13 Suitable Spotted Owl Habitat by Alternative (Acres)

	Alternative							
	NC	A	C	E	F	H	I	Q (Preferred)
Wilderness, RNA, & Other Reserved Lands*	180,000	180,000	180,000	180,000	180,000	180,000	180,000	180,000
Lands Withdrawn from Timber Harvest Due to Land Allocations**	20,000	14,000	12,000	29,000	70,000	242,000	86,000	42,500
Designated SOHAs								
1. On Full Yield Timber Lands	0	28,000	37,000	30,000	14,000	4,000	0	30,000
2. On Reduced Yield Timber Lands	0	23,000	6,000	21,000	21,000	14,000	44,000	19,500
Habitat in Remaining Allocations***								
1. Suitable for Timber Production	355,000	315,000	325,000	303,000	290,000	152,000	265,000	303,000
2. Not Suitable for Timber Production****	45,000	40,000	40,000	37,000	25,000	7,500	25,000	25,000

* *Includes Wilderness, RNAs, and Management Areas DA1-DA3, DA9, DA13 in the Bull Run Watershed Management Area, and Management Areas EA1, EA4, EA9, EA10, EA12, EA13 in the Columbia Gorge National Scenic Area.*

** *Includes Management Areas A4-A7, A9-A13.*

*** *Includes Management Areas B1-B12, C1, DB2, DB5, DB7, DB8, DC1, EB2, EB5, and EB7.*

**** *Not suitable due to biological reasons- unable to assess whether habitat occurs in blocks large enough to support spotted owls.*

However, the amount of suitable spotted owl habitat protected through management areas other than SOHAs varies immensely by alternative. Amount of suitable spotted owl habitat protected would vary from 200,000 acres under the NC Alternative up to 440,00 acres in Alternative H. Table II-14 shows this variation by alternative, with habitat displayed in four categories:

- Wilderness, RNAs, other Congressionally and administratively mandated reserved lands
- Lands withdrawn from timber production due to other management allocations
- SOHAs
- Habitat in the remaining allocations, managed for timber production

Table II-14 Acres and Number of Spotted Owl Habitat Areas

Alternative							
NC	A	C	E	F	H	I	Q
Acres Per Site							
0	1500	1500	1500	1500	1875	1875	1500
Number of Sites							
0	66	66	66	66	72	72	66

Peregrine Falcon

Two nesting pairs were discovered on the Forest in the spring of 1990. No action would be taken which would adversely affect recovery of this species under any alternative. In all alternatives, nesting pairs would be protected in a land allocation which is compatible with protection of peregrine habitat. Potential nesting locations would be protected with compatible land allocations (various land allocations designated as A or B). Under Alternative Q, Forestwide Standards and Guidelines would provide additional protection.

Bald Eagle

The bald eagle, a federally-listed threatened species in Oregon, requires habitat consisting of scattered old-growth conifer trees near open water (see Chapter III, Wildlife). While no eagles currently nest on the Forest, potential nesting habitat is present. Potential bald eagle nesting habitat will be provided in two primary ways: 1) protecting it from timber harvest and 2) keeping disruptive activities away from potential nest sites. Table II-15 shows how bald eagles would be managed by alternative. Under Alternatives F and I, a specific land allocation (A13-Bald Eagle Habitat Areas) would be added. Each potential nesting site would be at least 30 acres in size to conform with Bald Eagle Management Guidelines for Oregon and Washington.

Table II- 15 Acres and Number of Bald Eagle Habitat Sites (A13)

Alternative							
NC	A	C	E	F	H	I	Q
Number of Acres							
928	0	0	0	928	928	928	928
Number of Sites							
26	0	0	0	26	26	26	26

Sensitive Species

Including the above threatened and endangered species, there are 16 species of animals and 49 species of plants present (or suspected to be present) on the Forest which are listed as sensitive by the Regional Forester. See the spotted owl section in this chapter for more discussion on that species, which is proposed for listing as threatened by the U.S. Fish and Wildlife Service. No specific land allocations have been made for these remaining species. They will, however, be protected under various other land allocations such as the Columbia River Gorge Scenic Area (A1), Wilderness (A2), Spotted Owl Habitat Areas (A8), Designated Wild, Scenic and Recreational Rivers (B1), Pileated Woodpecker/Pine Marten Habitat Areas (B5), Bull Run Watershed Management Unit (D) and through Forestwide Standards and Guidelines.

Other Management Indicator Species

Deer and Elk

Winter range and quality forage areas are the key habitats for deer and elk. The key component of winter range is thermal cover. High quality forage is found primarily in meadows, pastures or riparian areas. These habitats occur naturally or can be created by timber harvest, enhancement projects and forage seeding. Increasing both winter range quality and the amount and quality of meadow and riparian habitat will increase habitat capability for deer and elk and may result in an increase in deer and elk populations.

Each alternative has a different potential for deer and elk habitat capability. Timber is harvested, forage enhanced, roads closed and meadows created to improve habitat for desired numbers of deer and elk. Under Alternatives NC, A and C, there would be moderate to high emphasis on timber harvest but low emphasis on these habitat improvement projects designed to increase deer and elk habitat capability. Under Alternatives E, F and H, there would be low to moderate emphasis on timber harvest and moderate emphasis on habitat improvement projects designed to increase deer and elk habitat capability. Under alternatives Q and I, there would be low emphasis on timber harvest and high emphasis on habitat improvement projects designed to increase deer and elk habitat capability. In some alternatives, clearcuts would be scattered within a subbasin. In others, winter range would be optimized for deer and elk, therefore emphasis would be on retention of thermal cover. In all alternatives, projects such as creation of permanent meadows, forage seeding and road closures would occur but the number of such projects differs by alternatives. These differences are presented in Table II-16.

Management Area B10 emphasizes management of deer and elk winter range by maximizing optimal cover/forage ratios, minimizing road densities and maximizing big game habitat improvement projects within winter range. This would occur in alternatives F, Q, H, and I. Management Area B11 emphasizes management of deer and elk summer range by maximizing cover/forage ratios and big game habitat improvement projects within summer range emphasis areas. This would occur in Alternatives Q, H, and I.

Table II-16 Variations in Deer and Elk Management by Alternative

Alternative							
NC	A	C	E	F	H	I	Q
Forage Seeding (Proportion of Harvested Acre Seeded)							
10	10	10	40	45	45	45	45
Forage Seeding (Winter Range Only)							
10	10	10	40	75	75	75	75
Emphasis on Winter Range Management							
Low	Low	Low	Mod	High	High	High	High
Emphasis on Summer Range Management							
No	No	No	No	No	Yes	Yes	Yes
Emphasis on Big Game Habitat Improvement Projects							
Low	Low	Low	Mod	Mod	Mod	High	High

Table II-17 Comparison of Issues and Concerns Responses for Management Indicator Species

Decade	Alternative							
	NC	A	C	E	F	H	I	Q
Pileated Woodpecker (Number of Pairs)								
1	0	96	96	96	96	96	96	96
2	0	96	96	96	96	96	96	96
5	0	96	96	96	96	96	96	96
Pine Marten (Number of Pairs)								
1	0	231	231	231	231	231	231	231
2	0	231	231	231	231	231	231	231
5	0	231	231	231	231	231	231	231
Merriam's Turkey (Number of Animals)								
1	2200	2200	2000	3800	4600	3800	5400	4100
2	3800	3300	3000	4900	5800	5500	6500	5200
5	4000	3900	4100	6400	6900	5600	6900	5800
Silver-Gray Squirrel (Number of Animals)								
1	2200	2200	2000	3800	4600	3800	5400	4100
2	5720	4620	4200	10260	10120	11400	13500	9840
5	6160	6160	6400	15580	15640	15200	17280	13940

Pileated Woodpecker/Pine Marten

Pileated woodpecker and pine marten are both management indicator species on the Mt. Hood. They are dependant upon mature/old growth conifer habitat with large amounts of dead and down woody material for food, cover and nesting sites. This habitat occurs naturally in undisturbed areas dominated by conifers (ie. Wilderness, SOHA's). Because these areas are not evenly distributed across the Forest, they can provide only a portion of the habitat needed for viable populations.

Habitat (Land Allocation B-5) would be managed for pileated woodpecker and pine marten in Alternatives A-Q (Table II-17). Size and number of areas do not vary by alternative. Timber may be harvested within these areas as long as the desired future conditions are met and a management plan developed for each MR. (See also Standards and Guidelines for B5 Pileated Woodpecker/Pine Marten habitat in Chapter 4 of the Forest Plan. Stands would be suitable as habitat at about 80-100 years. The NC alternative would provide no special management for pileated woodpecker and pine marten. Timber under the NC alternative would be managed on a 90 year rotation.

MRs for pileated woodpecker consist of 600 acres with a contiguous core area of 300 ac mature habitat. Pine marten MRs are 320 acres with a contiguous core area of 160 acres mature habitat. Woodpecker MRs are spaced approximately 5 miles apart, from center, and every two miles, from center for marten MRs.

Those alternatives that emphasize non-game wildlife will provide for mature/old growth conifer habitat in addition to the MR level. Numbers of pileated woodpeckers and pine martens by alternative for decades 1, 2, and 5 are shown inTable II-18.

Table II-18 Acres and Number of Pileated Woodpecker/Pine Marten Management Requirement Areas by Alternative

	Alternatives							
	NC	A	C	E	F	H	I	Q
Pileated Woodpecker (PW) MRs								
	0	96	96	96	96	96	96	96
Pine Marten (PM) MRs								
	0	231	231	231	231	231	231	231
Core Area Acres								
PW	0	300	300	300	300	300	300	300
PM	0	160	160	160	160	160	160	160
Total Area Acres								
PW	0	600	600	600	600	600	600	600
PM	0	320	320	320	320	320	320	320
Minimum # of Acres Managed for Mature Conifer Habitat or MR								
Core	0	65,760	65,760	65,760	65,760	65,760	65,760	65,760
Total	0	131,520	131,520	131,520	131,520	131,520	131,520	131,520

Merriam's Turkey

Suitable turkey habitat includes an even distribution of mature, mixed conifer stands, older-aged oak stands and early successional conifer stands with interspersed forested and open habitats.

Habitat for this species will be provided by designating a pine/oak land management allocation in which maintainance of forage and nesting habitat for the turkey is a desired goal. In the preferred alternative, Forestwide standards and guidelines would assure suitable habitat remains outside of specifically designated lands (see standards and guidelines for B4 and Forestwide standards and guidelines).

Suitable habitat conditions for turkey would be provided under those alternatives that emphasize non-game wildlife and some land allocations such as A2-Wilderness, B5-Pileated Woodpecker/Pine Marten, and B10-Deer/Elk Winter Range.

Pine/oak habitat would be managed for in Alternatives E - I. Numbers of turkey for decades 1,2 and 5 for each alternative is found in Table II-17.

Silver Gray Squirrel

Silver gray squirrel serves as an indicator of management activities in the ponderosa pine/white oak habitat. The habitat used by the silver gray squirrel includes a variety of mixed ponderosa pine/Oregon white oak forests ranging from fairly open, sparse stands to dense clusters of pole-sized trees which include some larger pines.

Habitat for this species will be provided by: 1) designating a pine/oak land management allocation in which maintainance of forage and nesting habitat for the squirrel is a desired goal and 2) Forest wide Standards and Guidelines to assure suitable habitat remains outside of specifically designated lands (see Standards and Guidelines for B4 and Forest wide Standards and Guidelines).

Suitable habitat conditions for squirrel would be provided under those alternatives that emphasize non-game wildlife and some land allocations such as A2-Wilderness, B5-Pileated Woodpecker/Pine Marten, and B10-Deer/Elk Winter Range.

Pine/oak habitat would be managed for in Alternatives E - I. Numbers of squirrel for decades 1,2 and 5 for each alternative is found in Table II-17.

Recreation

Introduction

The Mt. Hood National Forest is the eighth most visited national forest in the United States and one of eleven urban National Forests nationally. It is the most visited forest in the State of Oregon. Multnomah Falls, located within ten minutes walking distance from Interstate Highway 84 in the Columbia River Gorge National Scenic Area, is visited by approximately of two million people a year. Timberline Lodge, a national historic landmark in a year-round skiing area, is visited more than one million times per year. These are examples of developed recreational opportunities.

For the purposes of this discussion, "dispersed recreation" is defined as occurring outside of areas managed to concentrate use, developed areas (Management Area A10), and outside of Wilderness (Management Area A2). On this Forest, dispersed recreation is subdivided into five Recreation Opportunity Spectrum (hereafter abbreviated as ROS) categories: Semi-Primitive Non-motorized (SPNM), Semi-Primitive Motorized (SPM), Roaded Natural (RN), Roaded Modified (RM), and Rural (R). The kinds of recreation provided by these categories is described in Chapter III. Carrying capacities for each ROS class, which determine supply capability, are explained in Appendix B.

The demand for Wilderness and both types of dispersed semi-primitive categories of recreation already exceeds the amount the Forest can supply. It is expected that, due to increases in population alone, the difference between demand and supply for these types of recreational experiences will increase in the future under any of the alternatives considered. Chapter IV of the Forest Plan addresses measures which will be taken to limit all types of recreational use to the amount that can be supplied consistently with ROS Standards.

The supply/demand issue is primarily one related to the type and quantity of particular types of opportunities. Another significant facet of the Recreation Public Issue has to do with quality. This is addressed in two ways:

- the standard of recreational facilities to be provided, and
- the visual condition of viewsheds.

The ID Team, in consultation with the Regional and Washington, D.C. Offices of the Forest Service, proposed the provision of a "standard" level of service under all alternatives. This is intended to meet the demands of the public in a manner which is responsive to changing desires over time. In Forest Service terms, this would entail "Full Service Management" of all types of recreation (Cleaning Recreation Sites, U.S. Department of Agriculture, Forest Service Publication 8023 1801, ED & T 9009.)

The estimates shown in this document regarding recreational demand were made as follows. Current use figures were obtained from Forest records for each ROS category. These figures were increased at the rate of 0.41 percent per year to estimate increases in demand. This rate is based on the Oregon Department of Parks and Recreation 1988 Statewide Comprehensive Outdoor Recreation Plan (SCORP) and the 1987 Pacific Northwest Demand Survey.

Table II-19 illustrates the percent of recreation demand supplied by each alternative in the year 2040.

Developed Recreation

Supply = 3.0 MM RVDs Per Year

Demand = 1.6 MM RVDs (Year 10), 1.9 (Year 20), 2.2 (Year 30), 2.5 (Year 40), 2.9 (Year 50)

Management of developed recreation sites does not change significantly by alternative. Under any of the alternatives considered, the existing quantity of developed RVDs will be supplied for the next fifty years. This is sufficient to meet the overall demand for developed recreation even though the supply and demand for individual activities may vary. This is shown in Figure II-9.

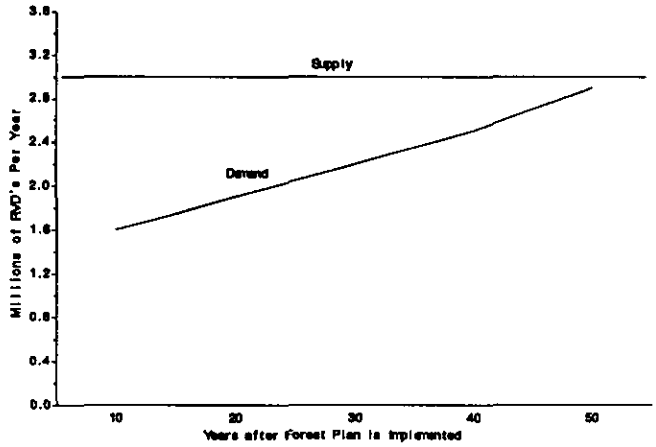
Table II-19 Wilderness Resource Spectrum (WRS) Acres and Capacity by Year 2040

WRS Class	Units	Alternative							
		NC	A	C	E	F	H	I	Q (Preferred)
Primitive Trailed	MAcres	168.4	168.4	168.4	168.4	168.4	168.4	171.5	168.4
	MRVDs[1]	126.3	126.3	126.3	126.3	126.3	126.3	128.6	126.3
Semi-Primitive Trailed	MAcres	13.8	13.8	13.8	13.8	13.8	13.8	17.8	13.8
	MRVDs[2]	13.8	13.8	13.8	13.8	13.8	13.8	17.8	13.8
Transition	MAcres	4.0	4.0	4.0	4.0	4.0	4.0	4.7	4.0
	MRVDs[2]	4.0	4.0	4.0	4.0	4.0	4.0	4.7	4.0
Total	MAcres	186.2	194.0	186.2	186.2	186.2	186.2	186.2	186.2
	MRVDs	144.1	151.1	144.1	144.1	144.1	144.1	144.1	144.1

[1] *Based on assumption coefficient of 0.75 RVD/Ac/year.*

[2] *Based on assumption coefficient of 1.00 RVD/Ac/year.*

Figure II-9 Supply VS Demand: Developed Recreation



The current level of spending on developed recreation administration, operation, and maintenance has resulted in the provision of less than standard level of service. The emphasis in all alternatives is to bring facilities back up to the standard level and keep them there. This means the focus will be on reconstruction/rehabilitation of existing sites.

Wilderness Recreation

The Mt. Hood National Forest contains approximately 186,200 acres of existing Wilderness. See Chapter III, Table III-44 for list of individual areas. This acreage remains the same in all alternatives except I. Alternative I recommends approximately 7,770 acres to Wilderness designation. These acres were identified as the Olallie Further Planning Area in the 1984 Oregon Omnibus Wilderness Act.

Supply = 144,000 RVDs Per Year, All Alternatives*

Demand = 228,000 RVDs (Year 10), 321,000 (Year 20), 899,000 (Year 50)

*Alternative I Supply = 151,000 RVDs Per Year for Next 50 Years

Figure II-10 shows that, under any of the alternatives considered, the existing quantity of Wilderness RVDs demanded by the public on the Mt. Hood National Forest cannot be met by any of the alternatives considered. This demand/supply deficit increases in the future. Other than in the Olallie Further Planning Area, the 1984 Oregon Wilderness Act does not require the Department of Agriculture to review the wilderness option prior to the revision of the plans, but shall review the wilderness options when the plans are revised.

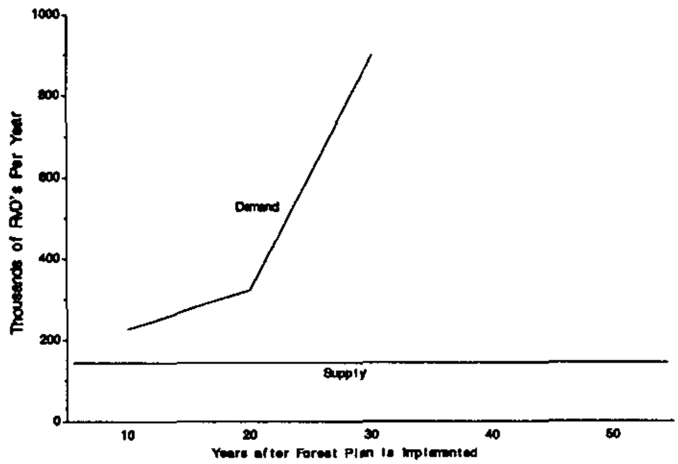
Table II-20 shows the acres and capacity by Wilderness Resource Spectrum Class by each alternative.

Table II-20 Percent of Recreation Demand Supplied in Year 2040 (Percent)

	Alternative							
	NC	A	C	E	F	H	I	Q (Preferred)
Dispersed Recreation by ROS Class[1]								
P	16	16	16	16	16	16	17	16
SPNM	8	13	10	16	23	17	25	18
SPM	6	4	1	3	5	21	1	4
RN	44	66	43	78	102	135	151	102
RM	188	400	189	119	60	44	7	71
R	8	8	8	8	7	10	7	8
Developed Recreation	103	103	103	103	103	103	103	103

[1] *P=Primitive, SPNM=Semi-primitive Non-motorized, SPM=Semi-primitive Motorized, RN=Roaded Natural, RM=Roaded Modified, R=Rural.*

Figure II-10 Supply VS Demand: Wilderness Recreation



Dispersed Recreation

Table II-21 quantifies the supply/demand situation with respect to the six ROS categories of dispersed recreation analyzed. The primitive ROS class accounts for wilderness.

Most roaded modified RVDs are supplied as a function of timber harvesting. Most roaded natural RVDs result from the less intensive harvesting which occurs in the Category B Management Areas. By the fifth decade, only alternatives A, NC, C, and E will supply enough roaded modified RVDs to meet projected demand. All but alternatives A, NC, E, and C will also meet the demand for roaded natural opportunities at that time.

All of the alternatives will fall short of meeting demand for semi-primitive motorized or non-motorized opportunities if the fifth decade. Figures II-11 and II-12 show that some alternatives will do much better than others in trying to make up for this shortfall. The level of supply of dispersed semi-primitive RVDs is a measure of responsiveness to the Recreation Public Issue.

Table II-21 Supply VS Demand for Dispersed Recreation (Millions of RVDs/Year)

	Type of Dispersed Recreational Setting																	
	Primitive			Semi-Primitive Non-motorized			Semi-Primitive Motorized			Roaded Natural			Roaded Modified			Rural		
Demand [1] (Decade)	1	2	5	1	2	5	1	2	5	1	2	5	1	2	5	1	2	5
	0.228	0.321	0.899	0.341	0.481	1.349	0.171	0.241	0.674	1.251	1.764	4.946	0.853	1.203	3.372	2.787	3.430	11.016
Alternatives	Amount Supplied by Each Alternative (Capacity) [2]																	
NC	0.144	0.144	0.144	0.108	0.108	0.108	0.038	0.038	0.038	2.165	2.165	2.165	6.327	6.327	6.327	0.916	0.916	0.916
A	0.144	0.144	0.144	0.172	0.172	0.172	0.028	0.028	0.028	3.274	3.274	3.274	4.816	4.816	4.816	0.916	0.916	0.916
C	0.144	0.144	0.144	0.138	0.138	0.138	0.005	0.005	0.005	2.119	2.119	2.119	6.376	6.376	6.736	0.923	0.923	0.923
E	0.144	0.144	0.144	0.217	0.217	0.217	0.020	0.020	0.020	3.641	3.641	3.641	4.007	4.007	4.007	0.931	0.931	0.931
F	0.144	0.144	0.144	0.312	0.312	0.312	0.035	0.035	0.035	5.055	5.055	5.055	2.035	2.035	2.035	0.793	0.793	0.793
H	0.144	0.144	0.144	0.227	0.227	0.227	0.002	0.002	0.002	6.658	6.658	6.658	1.461	1.461	1.461	1.075	1.075	1.075
I	0.151	0.151	0.151	0.333	0.333	0.333	0.009	0.009	0.009	7.450	7.450	7.450	0.251	0.251	0.251	0.806	0.806	0.806
Q (Preferred)	0.144	0.144	0.144	0.248	0.248	0.248	0.027	0.027	0.027	5.037	5.037	5.037	2.381	2.381	2.381	0.909	0.909	0.909

[1] *Based on 1988 SCORP growth predictions and 1987 Pacific Northwest Demand Survey.*

[2] *All Roadless Areas or parts of available for timber harvest were entered in the first decade; therefore, supply doesn't change within an alternative by decade, by ROS class.*

Figure II-11 Supply of Dispersed, Semi-Primitive Motorized Recreation after 50 Years

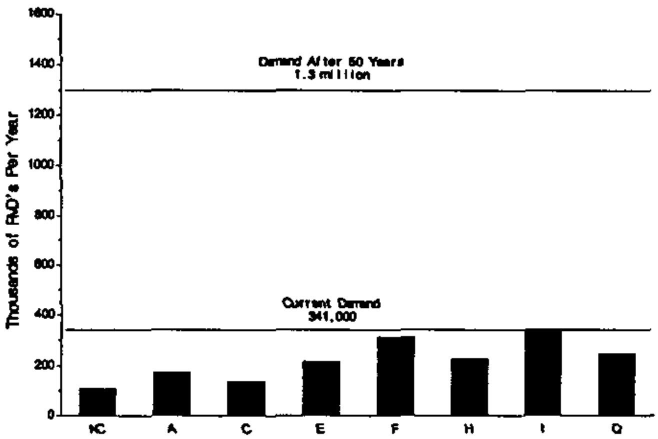
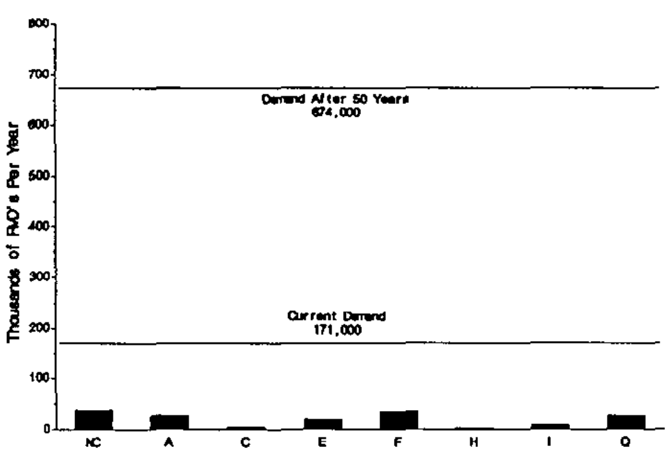


Figure II-12 Supply of Dispersed, Semi-Primitive Nonmotorized Recreation after 50 Years



Quality of Viewsheds

Table II-22 shows the acreage assigned to different visual quality objectives by alternative.

The quality of viewsheds affects all forest recreationists, regardless of whether they are seeking a developed, dispersed, or wilderness type of experience. For this reason two indicators of responsiveness to the Recreation Public Issue have to do with how many of the Forest's 46 most sensitive viewsheds will be naturally appearing or only slightly altered in fifty years. The sensitive viewsheds are listed in Chapter IV, as well as the number of viewsheds appearing moderately or heavily altered.

Roadless Areas

Appendix C describes 11 non-Wilderness, roadless areas which were considered for unroaded management. Recreationists desiring unroaded experiences at or near the "primitive" end of the recreation opportunity spectrum depend on such areas in addition to legislated Wilderness. Certain kinds of plants and animals also find the majority of their needs fulfilled from these areas.

All alternatives have the 186,200 acres of legislated Wilderness assigned to Management Area A2. Only Alternative I adds more acres to this management area, consisting of the 7,770 acre unroaded portion of the Olallie Further Planning Area.

Table II-23 quantifies how many of the 11 unroaded areas will have roads built in them during the first decade, how many will have such activities deferred for the next 15 years, and how many do not have roads planned in them. This data is also portrayed graphically in Figure II-13. Note that the number of areas remaining unroaded after 15 and 50 years are a measure of responsiveness to the Unroaded Area Issue. All areas available for timber entry will be entered in the first decade; therefore, areas remaining unroaded after 15 and 50 years are the same.

Table II-22 Assigned Visual Quality Objectives

Visual Quality Objectives	Unit of Measure	Alternative							
		NC	A	C	E	F	H	I	Q (Preferred)
Preservation	Acres	194,300	192,200	192,200	192,200	192,200	192,200	192,200	192,200
Retention	Acres	126,500	91,600	50,800	116,300	189,700	364,400	155,400	137,300
Partial Retention	Acres	195,000	205,100	84,300	203,700	292,200	222,900	213,500	246,200
Modification	Acres	148,900	154,900	201,700	150,300	105,300	77,100	136,500	468,900
Maximum Modification	Acres	382,900	398,400	518,800	386,600	270,900	198,400	350,900	0

Table II-23 Disposition of the Unroaded Areas

Disposition	Unit of Measure	Alternative							
		NC	A	C	E	F	H	I	Q (Preferred)
Roaded First Decade	Number of Areas	8	8	9	8	2	2	1	5
Assigned to roaded management prescriptions, but have no development planned for the next 15 years	Number of Areas	0	0	0	0	0	0	0	0
Assigned to unroaded management prescriptions	Number of Areas	3	3	2	3	9	9	10	6

Table II-24 Development of the Roadless Areas During the Next 10 Years

Activity or Output[1]	Alternative							
	NC	A	C	E	F	H	I	Q (Preferred)
Acres Roaded/Harvested	3,478	3,463	6,028	2,901	346	287	373	1,470
MMCF Harvested	30.4	29.5	49.9	25.8	6.8	1.8	3.2	13.0
Roading Cost (Million$)	12.2	12.2	20.5	8.9	2.2	0.5	0.1	5.9

[1] *Derived from FEIS Appendix C, Roadless Areas.*

Figure II-13 Areas Retaining Unroaded Characteristics

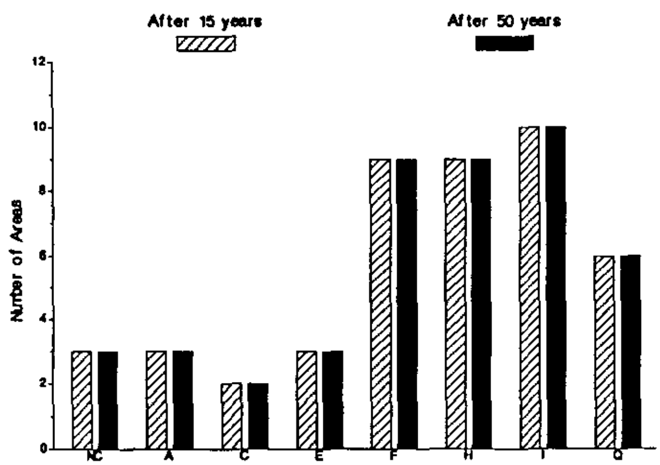


Table II-25 shows the Roadless Area acres assigned to unroaded management prescriptions.

Wild and Scenic Rivers

Several individuals, the State of Oregon, and river and other conservation groups identified 12 additional rivers on the Forest needing further study as potential additions to the National Wild and Scenic River system. As a result, eligibility studies were conducted on these rivers to determine if they were eligible for further study. For those rivers or river segments found eligible, interim protection will continue until it is determined that the river is not suitable for inclusion into the Wild and Scenic Rivers System. To meet planning needs for Mt. Hood Meadows Ski Area, the suitability study for the East Fork of the Hood River was completed as a part of this Land and Resource Management Plan. Due to time limitations, it was not possible to complete the suitability studies for other rivers found eligible. Those studies will be completed in a study subsequent to this plan.

See Appendix E for further information on Wild and Scenic River Eligibility/Suitability studies.

Management of Other Forest Programs

Management of Road Construction and Maintenance

Since most roads on the Forest are for timber harvest activities, amounts of road construction, reconstruction and maintenance would all be greater in alternatives in which more land is managed for timber production. (Road needs would be more indirectly related to timber harvest volume.) In all alternatives, however, at least 80% of the land tentatively suitable for timber production can be reached by existing roads. (See Chapter III for a discussion of the present status of the road system.)

Construction of New Roads

Amounts of roads to be constructed in the first decade range from 309 miles/year in Alternative C to 74 miles/year in Alternative H. More roads would be constructed in alternatives in which more presently undeveloped areas would be available for timber harvest. Some roads would be constructed in the 2nd decade to provide access to timber scheduled for harvest in all alternatives. The rate of development is dependent upon scheduled entries. Projected needs for the planning horizon of 50 years (other than the first and second decade) are somewhat tentative, and the transportation system will remain flexible to respond to future management needs.

Table II-25 Roadless Area Acres Assigned to Unroaded Management Prescriptions

Roadless Area	Existing Acres	Alternative NC	A	C	E	F	H	I	Q (Preferred)
Badger Creek	850	0	0	0	0	840	670	510	0
Bull of the Woods	8,660	780	1,040	690	1,300	8,490	8,570	8,140	2,510
Eagle	17,270	16,060	16,060	15,540	16,230	17,100	16,410	17,100	16,230
Lake (Outside Bull Run)	1,350	0	90	90	590	1,190	1,350	1,300	990
Larch Mountain	13,120	12,460	12,460	12,330	12,600	12,600	12,600	12,600	12,730
Mt. Hood Additions	12,940	0	0	0	260	11,390	11,000	12,290	4,400
Olallie	7,770	7,300	7,300	0	7,460	7,770	7,770	7,770	7,770
Roaring River	27,250	19,350	19,350	4,900	22,070	24,530	27,250	26,430	22,350
Salmon-Huckleberry	17,650	1,060	1,060	710	3,710	14,120	14,650	16,410	4,240
Twin Lakes	6,050	0	0	0	120	5,990	5,990	5,990	5,450
Wind Creek	5,440	0	0	0	3,260	5,170	5,220	5,280	4,460
Total Acres	118,350	57,010	57,360	34,260	67,600	109,190	111,480	113,820	81,130

Table II- 26 Eligible/Suitable Wild & Scenic Rivers

Issue/Outputs/Effects	Alternative NC	A	C	E	F	H	I	Q (Preferred)
Eligible Rivers								
Number	0	10	10	10	10	10	10	10
Miles	0	89.7	89.7	89.7	89.7	89.7	89.7	89.7
Acres	0	28,926	28,926	28,926	28,926	28,926	28,926	28,926
(Does not include E. Fk Hood River. It is considered separately below)								
East Fork Hood River								
Miles and Acres Recommended for National Designation by Classification								
Miles Scenic	0	0	0	0	0	0	1.5	0
Acres Scenic	0	0	0	0	0	0	524	0
Miles Recreational	0	0	0	0	14.9	0	13.4	0
Acres Recreational	0	0	0	0	4,668	0	4,144	0

Road construction.

Permanent Road Closures

In some alternatives, roads may be obliterated, closed, seeded, and removed from the transportation system. This would result in eliminating maintenance on these permanently closed roads.

Roads may also have their maintenance level reduced to a level 1. This would result in reducing maintenance on these roads while keeping them on the transportation system.

Lands and Special Uses

Effects of alternatives on lands programs are related to the kind and number of restrictions on uses of lands. Numbers of acres available for land exchange would be greater when fewer acres are designated for special management, such as SIAs, RNAs, and undeveloped areas. This same relationship exists with special uses. More acres with special management means greater reductions in availability of special use permits and greater restrictions that would be needed in the permits.

The land adjustment program continues to include acquisition of tracts that are identified as important to conserve fish and wildlife habitat, protect environmentally and historically sensitive areas, consolidate ownership to increase management efficiency, protect exceptional scenic qualities and provide recreation opportunities for the public. Acquisition of land to increase management efficiency includes a reduction in the number of rights-of- way that would need to be acquired for timber access and public use. This would reduce land line maintenance costs and improve efficiency.

None of the alternatives would adversely affect the land purchase program, because purchases are authorized by Congress annually for areas that currently qualify. None of the alternatives will affect title claims, which are generated by actions of others on NFS lands.

Utility and other corridors are the same in all alternatives. See Chapter 4 of the Forest Plan for specific Standards and Guidelines.

Minerals and Geology

Mining activity is generally initiated by the mining industry in response to a changing demand for mineral resources or fluctuations in mineral commodity prices. Alternatives in this Final EIS would not affect the overall demand for or price of mineral resources. Cost of mineral extraction would vary by alternative depending on the restrictions imposed under that alternative. Implementation of any of the alternatives would have little effect on industry's interest in initiating mineral exploration and development activities.

The standards and guidelines (Chapter 4 of the Forest Plan) set operating guidelines for mineral exploration and development. The standards and guidelines for some land allocations place restrictions on mineral activities. Therefore, alternatives which contain larger amounts of land in these more restrictive categories could be considered more restrictive for minerals development.

The standards and guidelines for different management areas also vary in the way they affect rock and gravel resources. Rock quarries would be prohibited in several management areas. The effects of this and other restrictions on mineral operating activities are discussed in Chapter IV of this Final EIS.

Fire Management

Wildfire incidence will be higher in alternatives which call for increased industrial operations and road access for recreation. In general, this is true for alternatives NC, A, C, and E. Industrial operations connected with timber harvest cause the most damaging wildfires and account for most of the money spent on fire suppression. The percent of acres burned from industrial fires varies by alternative and decade but ranges between 70 to 80% of the total acres burned per decade. Many industrial fires start in timber stands of high value, and expensive equipment is often in the fire area.

Fires caused by recreationists are higher in number than any other cause but the number of acres burned is much smaller than industrial fires. Due to a change in the mix of recreational opportunities on the Forest, the number of fires caused by recreationists is expected to decline in alternatives from the current (Alternative NC).

In all alternatives, fires will be allowed to play a more natural role in Wilderness. An analysis of ecosystem changes in Wilderness has shown little effect caused by the Forest's past policies of total fire suppression, an exception to this being the Badger Creek Wilderness. In all Wilderness, natural ignitions from lightning will be declared prescribed fires as long as they burn within approved prescription limits.

In Alternatives NC, A, C, and E, there will be a greater need for fuels treatment and the use of prescribed fire than in Alternatives F, H, I and Q due to increased timber harvest levels.

Air Quality

Suspended particulates, whether from natural or man-made sources, reduce visibility on and off the Forest. Natural sources of particulates include clouds and air with a high moisture content. Human-made sources are mainly particulates from prescribed burning both on and off the Forest. Alternatives NC, A, C and E, which have the highest timber harvests, would produce the highest levels of suspended particulates less than 10 microns in size (PM10) from prescribed burning. Under Alternatives F, H, I and Q, they would be less. In all alternatives, there should be substantial reductions from current quantities of suspended particulates currently produced on the Forest.

Outputs and Effects

This section presents resource outputs, some environmental effects (see Chapter IV for a complete description), activities, and costs associated with each alternative (assuming that the ASQ for each year will be harvested). Table II-27 includes those outputs and effects which can be reasonably quantified. Table II-28 includes those outputs, effects and activities which are qualitative and which cannot (or should not) be quantified. The content of the two tables (see the following pages) have equal significance; the only reason for separating them is that qualitative information requires more space to present in tabular form.

Table II-27 Quantitative Outputs and Effects by Alternative

Outputs/Effects	Unit	Alternative							
		NC	A	C	E	F	H	I	Q (Preferred)
Recreation									
Developed Recreation Use	MRVDs/ year								
1st Decade	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000
2nd Decade	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000
5th Decade	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000
Rural	MRVDs/ year								
1st Decade		916	916	923	931	793	1075	806	909
2nd Decade		916	916	923	931	793	1075	806	909
5th Decade		916	916	923	931	793	1075	806	909
Roaded Natural	MRVDs/ year								
1st Decade		2165	3274	2119	3841	5055	6658	7450	5037
2nd Decade		2165	3274	2119	3841	5055	6658	7450	5037
5th Decade		2165	3274	2119	3841	5055	6658	7450	5037
Roaded Modified	MRVDs/ year								
1st Decade		6327	4816	6376	4007	2035	1481	251	2381
2nd Decade		6327	4816	6376	4007	2035	1481	251	2381
5th Decade		6327	4816	6376	4007	2035	1481	251	2381
Semiprimitive Motorized	MRVDs/ year								
1st Decade		38	28	5	20	35	2	9	27
2nd Decade		38	28	5	20	35	2	9	27
5th Decade		38	28	5	20	35	2	9	27
Semiprimitive Nonmotorized	MRVDs/ year								
1st Decade		108	172	138	217	312	227	333	248
2nd Decade		108	172	138	217	312	227	333	248
5th Decade		108	172	138	217	312	227	333	248
Wilderness Use	MRVDs/ year								
1st Decade		144	144	144	144	144	144	151	144
2nd Decade		144	144	144	144	144	144	151	144
5th Decade		144	144	144	144	144	144	151	144

Table II-27 Quantitative Outputs and Effects by Alternative (continued)

Outputs/Effects	Unit	Alternative							
		NC	A	C	E	F	H	I	Q (Preferred)
Trail Construction/ Reconstruction [1]	Average Annual Miles								
1st Decade		74	74	74	74	74	74	74	74
2nd Decade		74	74	74	74	74	74	74	74
5th Decade		74	74	74	74	74	74	74	74
Total Trail System	Miles								
1st Decade		1,430	1,430	1,430	1,430	1,430	1,430	1,430	1,430
2nd Decade		1,560	1,560	1,560	1,560	1,560	1,560	1,560	1,560
5th Decade		2,220	2,220	2,220	2,220	2,220	2,220	2,220	2,220
Roadless Areas Assigned to Undeveloped Management Prescriptions [2]	Acres								
1st Decade		57,010	57,360	34,260	67,600	109,190	111,480	113,820	81,130
2nd Decade		57,010	57,360	34,260	67,600	109,900	111,480	113,820	81,130
5th Decade		57,010	57,360	34,260	67,600	109,900	111,480	113,820	81,130
Scenic Quality									
Forestwide Visual Quality Objectives (VQOs)	M Acres								
Preservation		194.3	192.2	192.2	192.2	192.2	192.2	192.2	192.2
Retention		92.8	68.9	50.8	96.0	150.9	349.8	142.5	112.6
Partial Retention		228.7	227.8	84.3	224.0	331.0	237.5	226.4	270.9
Modification		287.9	267.6	238.0	288.9	284.1	161.4	415.6	468.9
Maximum Modification		243.9	285.7	482.5	248.0	92.1	114.1	71.8	0.0
Viewshed VQOs	M Acres								
Retention		73.2	77.6	31.9	74.1	125.0	150.6	76.7	91.4
Partial Retention		38.4	34.0	2.6	138.0	250.9	217.3	130.7	242.8
Wildlife and Fish									
Wildlife Use	WFUDs (M)								
1st Decade		157	169	157	246	257	288	298	298
2nd Decade		104	147	136	235	245	235	277	277
5th Decade		114	157	147	235	246	277	331	298

[1] *Combination of construction and reconstruction; total stays approximately the same, but mix between recons. & const. changes over time.*

[2] *All available Roadless Acres are entered in the first decade.*

Table II-27 Quantitative Outputs and Effects by Alternative (continued)

Outputs/Effects	Unit	Alternative NC	A	C	E	F	H	I	Q (Preferred)
Fish Use	WFUDs (M)								
1st Decade		289	289	289	289	289	289	289	289
2nd Decade		308	315	303	315	315	315	315	315
5th Decade		383	442	364	444	447	460	454	440
Anadromous Fish Commercial Harvest	Mpounds per year								
1st Decade		491	491	491	491	491	491	491	491
2nd Decade		decline	491	491	506	565	590	610	515
5th Decade		decline	491	decline	525	628	641	730	575
Fish Habitat Rehabilitation Mitigation/Improvement	M$/year 1982 $								
1st Decade		572	295	627	185	185	185	185	185
2nd Decade		590	332	664	199	199	199	199	199
5th Decade		590	369	738	221	221	221	221	221
Anadromous Fish Without Major Rehab Program	Smolt Habitat capability Index								
1st Decade		100	100	100	100	100	100	100	100
2nd Decade		80	95	94	96	102	103	102	101
5th Decade		60	90	70	85	110	115	117	103
Anadromous Fish With Major Rehab Program[3]	Smolt Habitat Capability Index								
1st Decade		100	100	100	100	100	100	100	100
2nd Decade		90	100	100	103	115	120	125	105
5th Decade		75	100	95	107	128	135	150	115
Legal Trout Without Major Rehab Program[3]	Legal Trout Index								
1st Decade		100	100	100	100	100	100	100	100
2nd Decade		85	96	95	99	101	102	102	101
5th Decade		70	93	80	98	103	105	104	102

[3] *100 is current potential habitat capability of 1,777,000 smolts, and 1,472,000 trout. Index values are shown both with and without a major rehabilitation program. Rehabilitation program funding is shown above. Anadromous fish population trends are relatively slow to react and in general, take a decade to react to management activities.*

Table II-27 Quantitative Outputs and Effects by Alternative (continued)

Outputs/Effects	Unit	Alternative							
		NC	A	C	E	F	H	I	Q (Preferred)
Legal Trout With Major Rehab Program[3]	Legal Trout Index								
1st Decade		100	100	100	100	100	100	100	100
2nd Decade		93	100	100	103	105	105	110	103
5th Decade		80	100	95	103	113	113	123	110
Threatened and Endangered Species									
Bald Eagle	HCI (#of Sites)								
1st Decade		26	0	0	0	26	26	26	26
2nd Decade		26	0	0	0	26	26	26	26
5th Decade		26	0	0	0	26	26	26	26
Spotted Owls	HCI (#of Pairs)								
1st Decade		166	171	167	167	173	175	173	173
2nd Decade		157	160	157	155	167	173	167	164
5th Decade		124	137	128	131	151	194	149	144
Management Indicator Species[4]									
Pileated Woodpecker	HCI (#of Pairs)								
1st Decade		267	272	269	267	278	280	277	275
2nd Decade		250	259	252	250	268	274	267	263
5th Decade		199	219	206	212	242	256	238	231
Deer	HCI (#of Animals)								
1st Decade		17400	18300	17400	24100	24900	28200	27400	28200
2nd Decade		13300	16600	15800	23300	22400	26600	23300	26600
5th Decade		14100	17400	16600	23300	24100	28200	26600	30700
Elk	HCI (#of Animals)								
1st Decade		4900	5100	4900	6500	6700	7300	7100	7350
2nd Decade		3900	4700	4500	6300	6100	6900	6300	6900
5th Decade		4100	4900	4700	6300	6500	7300	6900	7900

[4] *Spotted owls and salmonids are also management indicator species; the habitat capability index for these species are presented in the sections on Threatened and Endangered Species and Anadromous Fish, respectively.*

Table II-27 Quantitative Outputs and Effects by Alternative (continued)

Outputs/Effects	Unit	Alternative							
		NC	A	C	E	F	H	I	Q (Preferred)
Pine Marten	HCI (#of Animals)								
1st Decade		588	598	591	588	609	615	608	604
2nd Decade		552	571	559	553	590	601	588	579
5th Decade		452	492	492	477	537	565	530	513
Turkey	HCI (#of Animals)								
1st Decade		2,200	2,200	2,000	3,800	4,600	3,800	5,400	4,100
2nd Decade		3,800	3,300	3,000	4,900	5,800	5,500	6,500	5,600
5th Decade		4,000	3,200	2,900	4,850	5,900	5,400	6,400	5,500
Squirrel	HCI (#of Animals)								
1st Decade		2,200	2,200	2,000	3,800	4,600	3,800	5,400	4,100
2nd Decade		4,180	3,300	2,800	5,320	7,360	6,080	7,000	6,700
5th Decade		5,060	3,200	2,700	5,300	7,500	6,000	6,900	6,500
Range									
Grazing Capacity	MAUMs								
1st Decade		5.4	5.9	5.7	6.4	5.6	5.4	5.6	4.2
2nd Decade		2.4	2.9	2.1	4.6	2.9	2.4	3.2	4.6
5th Decade		3.9	4.5	2.9	2.5	2.6	2.3	2.7	4.1
Timber									
Allowable Sale Quantity	MMBF								
1st Decade		313	235	282	317	154	108	165	189
Allowable Sale Quantity	MMCF								
1st Decade		51.6	38.9	46.4	53.4	25.8	18.1	27.5	31.9
2nd Decade		51.6	38.9	46.4	40.1	25.8	18.1	27.5	31.9
5th Decade		51.6	38.9	46.4	37.6	25.8	18.1	27.5	31.9
Timber Sale Program Quantity	MMCF								
I. ASQ		51.6	38.9	46.4	53.4	25.8	18.1	27.5	31.9
II. Nonchargeable		7.2	5.4	6.5	7.5	3.6	2.5	3.8	4.5
Total Timber Sale Program Quantity		58.8	44.3	52.9	60.9	29.4	20.6	31.3	36.4
Reforestation	MAcres								
1st Decade		43	33	40	45	22	15	23	29
2nd Decade		41	31	37	37	21	16	22	28
5th Decade		41	31	38	26	19	14	17	24

Table II-27 Quantitative Outputs and Effects by Alternative (continued)

Outputs/Effects	Unit	Alternative							
		NC	A	C	E	F	H	I	Q (Preferred)
Long-Term Sustained Yield Capacity (LTSYC)	MMCF	51.6	38.9	46.4	37.6	25.8	18.1	27.5	31.9
Timber Growth in 5th Decade as % of LTSYC	Percent	79	83	78	83	102	99	93	92
Silvicultural Practices in the First Decade	MAcres/ year								
Regeneration Harvest		4.3	3.3	4.0	4.5	2.2	1.5	2.3	2.9
Commercial Thinning		0	0	0	0	0	0	0	0
Precommercial Thinning		2.7	2.3	2.6	2.3	2.1	1.7	2.0	2.2
Fertilization		0	0	0	0	0	0	0	0
Lands Tentatively Suitable for Timber Production	MAcres	753	678	678	678	678	678	678	678
Lands Where Timber Harvest is Allowed	MAcres	568	435	485	427	340	223	341	392
Soil and Water									
Water Yield	Avg. Annual MAcFt								
1st Decade		5,446	5,446	5,446	5,446	5,446	5,446	5,446	5,446
2nd Decade		5,446	5,446	5,446	5,446	5,446	5,446	5,446	5,446
5th Decade		5,446	5,446	5,446	5,446	5,446	5,446	5,446	5,446
Sediment Index	M Tons/ Decade								
1st Decade		375	318	342	364	272	248	276	289
2nd Decade		375	314	329	324	265	241	262	282
5th Decade		395	334	386	305	284	260	285	298
Minerals									
Energy Minerals Produced	Billion BTUs								
1st Decade		0	0	0	0	0	0	0	0
2nd Decade		3,800	3,800	3,800	3,800	3,800	3,800	3,800	3,800
5th Decade		33,000	33,000	33,000	33,000	33,000	33,000	33,000	33,000
Nonenergy Minerals	$MM								
1st Decade		1.80	2.70	3.00	3.20	1.20	0.75	1.20	1.80
2nd Decade		0.95	0.87	0.84	0.80	1.00	0.75	0.88	1.40
5th Decade		0.69	0.65	0.71	0.49	0.48	0.62	0.45	5.60

Table II-27 Quantitative Outputs and Effects by Alternative (continued)

Outputs/Effects	Unit	Alternative							
		NC	A	C	E	F	H	I	Q (Preferred)
Fire Management									
Fuel Treatment	Acres/ year								
1st Decade		4,470	3,410	4,120	4,570	2,340	1,820	2,640	3,060
Roads									
Road Construction	Miles/ decade								
1st Decade		247	255	309	304	113	74	115	166
2nd Decade		159	125	172	149	87	75	87	128
5th Decade		90	62	67	46	45	59	43	65
Road Reconstruction	Miles/ decade								
1st Decade		139	109.5	131	142.5	76	57	75	91.5
2nd Decade		139	101.5	126	108.5	75	57	75	90.5
5th Decade		131	99.5	118	98.5	70	52	69	84.5
Roads Suitable for Public Use Passenger Car	Miles/ Decade								
1st Decade		1327	1225	1376	1225	954	1225	1122	1122
2nd Decade		1327	1225	1376	1225	954	1225	1122	1122
5th Decade		1327	1225	1376	1225	954	1225	1122	1122
High Clearance Vehicle Only	Miles/ Decade								
1st Decade		2148	2192	2118	2206	1545	1345	1462	1678
2nd Decade		2196	2230	2169	2251	1553	1357	1471	1704
5th Decade		2278	2294	2236	2299	1574	1373	1494	1750
Economics									
Operational Costs	M$/Yr 1982$								
1st Decade		45,197	38,193	43,399	38,523	32,530	29,352	28,986	35,572
2nd Decade		45,197	38,193	43,399	38,523	32,530	29,352	28,986	35,572
5th Decade		45,197	38,193	43,399	38,523	32,530	29,352	28,986	35,572
Investment Costs	M$/Yr 1982$								
1st Decade		13,058	10,412	12,046	10,967	8,870	7,531	7,472	10,152
2nd Decade		13,058	10,412	12,046	10,967	8,870	7,531	7,472	10,152
5th Decade		13,058	10,412	12,046	10,967	8,870	7,531	7,472	10,152

Table II-27 Quantitative Outputs and Effects by Alternative (continued)

Outputs/Effects	Unit	Alternative NC	A	C	E	F	H	I	Q (Preferred)
Market Benefits	MM$/Yr								
1st Decade		61.0	45.5	55.9	60.8	29.7	20.6	31.7	36.0
2nd Decade		69.2	52.2	62.3	47.9	32.1	21.6	33.7	37.9
5th Decade		83.7	61.6	72.6	61.9	43.7	29.3	51.8	54.8
Nonmarket Benefits	MM$/Yr								
1st Decade		82.6	80.7	82.2	81.1	76.6	84.7	81.4	80.0
2nd Decade		81.8	80.7	82.1	81.4	77.1	84.1	81.5	80.1
5th Decade		83.6	83.6	83.6	84.1	79.7	88.1	85.6	83.1
Returns to Government	MM$/Yr								
1st Decade		48.1	35.5	44.0	47.1	23.1	15.9	24.4	27.1
2nd Decade		57.1	42.5	50.8	37.1	25.1	16.8	26.1	29.1
5th Decade		71.2	51.6	61.4	52.0	37.4	24.8	45.5	46.5
Payments to Counties	MM$/Yr								
1st Decade		12.0	8.9	11.0	11.8	5.8	4.0	6.1	6.8
Employment Opportunities									
Changes in Jobs	Jobs								
1st Decade		2,906	1,452	1,977	2,561	461	106	-211	964
Changes in Income	MM$								
1st Decade		62.4	25.7	40.3	55.3	-1.3	-12.2	-14.8	12.0

Table II-28 Qualitative Resource Outputs and Environmental Effects

	Alternative							
	NC	A	C	E	F	H	I	Q (Preferred)
Scenic Quality of the Forest	At least 12 of the Forest's 46 most sensitive viewsheds do not appear more than slightly altered in 50 years.	At least 12 of the Forest's 46 most sensitive viewsheds do not appear more than slightly altered in 50 years.	At least 2 of the Forest's 46 most sensitive viewsheds do not appear more than slightly altered in 50 years.	At least 21of the Forest's 46 most sensitive viewsheds do not appear more than slightly altered in 50 years.	At least 40 of the Forest's 46 most sensitive viewsheds do not appear more than slightly altered in 50 years.	At least 42 of the Forest's 46 most sensitive viewsheds do not appear more than slightly altered in 50 years.	At least 27 of the Forest's 46 most sensitive viewsheds do not appear more than slightly altered in 50 years.	At least 34 of the Forest's 46 most sensitive viewsheds do not appear more than slightly altered in 50 years.
Changes in Recreational Use Patterns	Semi-primitive non-motorized capacity would be reduced by one-half.	Semi-primitive non-motorized capacity would be reduced by one-half.	Dispersed roaded recreation opportunities are similar to current use patterns.	Semi-primitive motorized opportunities remain about the same as current use patterns.	Roaded natural settings would almost triple while roaded modified settings would be reduced by three times from current levels.	Semi-primitive motorized opportunities have decreased by nine-fold from current levels.	Wilderness capacity and acreage would increase by about 10,000 acres from current level.	Roaded natural settings would almost triple while roaded modified settings would be reduced by three times from current levels.
Accessibility for Exploration of Mineralized Areas	Same as Alternative A.	The road network will provide access for mineral exploration.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Effect on On-going Economic Trends: Changes in Employment Opportunities	Little change or small gains in wood products jobs; recreation jobs would increase over the first decade. Communities would probably not attempt to	Wood products jobs would lost;recre-ation-would increase over the first decade. Job losses in wood products industry may be an incentive to communities	Little change or small gains in wood products jobs; recreation jobs would increase over the first decade. Communities would probably not attempt to	Similar to Alternative NC. After first decade departure, however, there could be severe job losses in wood products industry.	Same as Alternative A, although wood products job losses may be more severe.	Same as Alternative A, although wood products job losses may be more severe.	Same as Alternative A, although wood products job losses may be more severe.	Same as Alternative A, although wood products job losses may be more severe.

Table II-28 Qualitative Resource Outputs and Environmental Effects (continued)

	Alternative							
	NC	A	C	E	F	H	I	Q (Preferred)
Changes in Employment Opportunities (continued)	capitalize on job potential in the rest of the service sector.	to try to attract other service sector employers.	capitalize on job potential in the rest of the service sector.					
Changes in Lifestyles	Little change from present, although new (service related) employment may bring in outsiders with different values.	Similar to present, although some wood products industry employees would experience career changes, possible relocation to a less desirable community, or permanent unemployment.New (service-related) employment may bring in outsiders w/different values. Quality of life would improve for those interested in amenity uses of the Forest.	Same as Alternative A.	After the first decade, same as Alternative A.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Table II-28 Qualitative Resource Outputs and Environmental Effects (continued)

	Alternative							
	NC	A	C	E	F	H	I	Q (Preferred)
Community Organization	Little change from present, although over the long-term a change in service related employment may lead to enough growth to cause a change in government structure.	Same as Alternative A.	Same as Alternative A	Similar to Alternative A, although end of departure sale schedule could cause community disruption in areas where a large proportion of employment is in the wood products industry.	Similar to Alternative A. Greater magnitude of changes could cause communities to dissolve or to pull together.	Similar to Alternative A. Greater magnitude of changes could cause communities to dissolve or to pull together.	Similar to Alternative A. Greater magnitude of changes could cause communities to dissolve or to pull together.	Similar to Alternative A. Greater magnitude of changes could cause communities to dissolve or to pull together.
Wetlands	Same as Alternative A.	Disturbance of a few wetlands along small streams, by road construction, will be likely, but will be mitigated. Disturbance by recreation facilities will be low. No disturbance by water control projects or facilities.	Same as Alternative A	Same as Alternative A	Disturbance of wetlands adjacent to streams, by road construction, will be unlikely. Disturbance by recreation facilities will be low. No disturbance by water control projects or facilities.	Disturbance of wetlands adjacent to streams, by road construction, will be unlikely. Disturbance by recreation facilities will be low. No disturbance by water control projects or facilities.	Disturbance of wetlands adjacent to streams, by road construction, will be unlikely. Disturbance by recreation facilities will be low. No disturbance by water control projects or facilities.	Disturbance of wetlands adjacent to streams, by road construction, will be unlikely. Disturbance by recreation facilities will be low. No disturbance by water control projects or facilities.

Table II-28 Qualitative Resource Outputs and Environmental Effects (continued)

	Alternative							
	NC	A	C	E	F	H	I	Q (Preferred)
Flood Plains	Same as Alternative A.	Disturbance of a few floodplains along small streams, by road construction, will be likely, but will be mitigated. Disturbance by recreation facilities will be low. No disturbance by water control projects or facilities.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Threatened and Endangered Species	Minimum protection as required under the Threaten- ed and Endangered Species Act. Management Areas included for bald eagels.	Minimum protection as required under the Threatened and Endangered Species Act.	Same as Alternative A.	Same as Alternative A.	Minimum protection as required under the Threaten-ed and Endangered Species Act. Management Areas are included for bald eagles.	Under these alternatives more land is allocated to non-consumptive uses. For some species, these alternatives will provide protection beyond the minimums required by the Threatened and Endangered Species Act.	Under these alternatives more land is allocated to non-consumptive uses. For some species, these alternatives will provide protection beyond the minimums required by the Threatened and Endangered Species Act.	Minimum protection as required under the Threatened and Endangered Species Act. Management Areas are included for bald eagles.

Table II-28 Qualitative Resource Outputs and Environmental Effects (continued)

	Alternative							
	NC	A	C	E	F	H	I	Q (Preferred)
Game Populations and Distributions	Same as Alternative A.	Some emphasis on deer and elk winter range management, but no standards and guidelines to protect deer, elk, squirrel, and turkey.	Same as Alternative A.	Standards and guidelines to protect deer and elk winter range. Standards and guidelines for turkey and squirrel would be included Management emphasis and a specific land allocation would be provided for half of turkey and squirrel range.	Standards and guidelines to protect deer and elk winter range. Standards and guidelines for turkey and squirrel would be included Management emphasis and a specific land allocation would be provided for half of turkey and squirrel range	Standards and guidelines to protect deer and elk winter range and a specific land allocation for management of winter and summer range. Moderate population numbers. Standards and guidelines for turkey and squirrel would be included. Management emphasis and a specific land allocation would be provided for half of turkey and squirrel range.	Standards and guidelines to protect deer and elk winter range and a specific land allocation for management of winter and summer range. Moderate population numbers. Standards and guidelines for turkey and squirrel would be included. Management emphasis and a specific land allocation would be provided for half of turkey and squirrel range.	Standards and guidelines to protect deer and elk winter range and a specific land allocation for management of winter and summer range. Moderate population numbers. Standards and guidelines for turkey and squirrel would be included. Management emphasis and a specific land allocation would be provided for half of turkey and squirrel range.

Table II-28 Qualitative Resource Outputs and Environmental Effects (continued)

	Alternative							
	NC	A	C	E	F	H	I	Q (Preferred)
Civil Rights, Including Minorities and Women	Same as Alternative A.	These rights are protected by law.	Same as Alternative A	Same as Alternative A	Same as Alternative A	Same as Alternative A	Same as Alternative A	Same as Alternative A
Historic and Cultural Resources	Required inventories & SHPO concurrences met. Greatest potential risk for impacts. Almost no sites interpreted.	Required inventories & SHPO concurrences met. Very large number of potential impacts. Al- most no sites interpreted.	Required inventories & SHPO concurrences met. Greatest potential risk for impacts. Almost no sites interpreted.	Required inventories & SHPO concurrences met. Slightly increased risk of potential impacts. Several sites are nterpreted & structures stabilized.	Required inventories & SHPO concurrences met. Notable decrease in potential impacts.A number of sites are interpreted & structures stabilized.	Required inventories & SHPO concurrences met. Few potential impacts after first decade. A few sites are interpreted.	Required inventories & SHPO concurrences met. Few potential impacts after first decade. Several sites are interpreted Some stands of old growth are designated as Natural Landmarks.	Required inventories & SHPO concurrences met. Somewhat less risk of potential impacts. Several sites are interpreted & structures stabilized.
Traditional Indian Resources	Same as Alternative A.	Availibility continues to diminish. Coordination with local tribes would remain at current level.	Greatest opportunity to increase supply and availibility of some resources. Systematic coordination with tribes would be needed.	Slight increase in availibility of some resources. Coordination with tribes would improve.	Availiblity of huckleberries tends to decline. Fisheries & other plants increase. Coordination with tribes improves.	Same as Alternative A.	Availiblity of plant resources diminish-es-Wildlife & fisheries flourish. Coordination with tribes would improve.	Availibility of huckleberries declines in some areas, increases in others. Wildlife, fisheries & other plants increase. Coordination with tribes would improve.

Economic Efficiency Analysis of Alternatives

Introduction

Economic efficiency analysis is required by the NFMA Regulations, 36 CFR 219, and plays an important role in the development and evaluation of benchmarks and alternatives

This and following sections explain some of the key concepts and terms used in analyzing economic efficiency. Some of the major differences in the economic consequences of alternatives and their responsiveness to the public issues are discussed. A more detailed discussion of the process used to analyze economic efficiency for each of the benchmarks and alternatives is given in Appendix B.

Net Public Benefit

The regulations (36 CFR 219.12(f)) say that the primary goal in forming alternatives is to provide a way to identify the alternative that comes closest to maximizing net public benefits.

Net public benefits are the overall long-term value of all outputs and positive effects (benefits), less all associated Forest inputs and negative effects (costs) from management activities. Some aspects of these benefits and costs can be quantified with dollar values, and some cannot. Because of this, net public benefits cannot be expressed as a purely quantitative economic measure.

Present Net Value

Present Net Value (PNV) is one part of net public benefit. It is equal to the sum of the present value of all the costs and benefits of an alternative. A four percent discount rate is required by Forest Service Manual 1909.17, Economic and Social Analysis Handbook.

Priced Outputs

Priced outputs are those that are, or can be, given a dollar valuation. These outputs fall into two categories: market and nonmarket. Market value is the unit price of an output normally exchanged in a market. Its value is what people are willing to pay as established by actual sales transactions. Nonmarket values, also referred to as assigned values, are the unit prices given to outputs which are not normally exchanged in a market. Comparable sales transaction data and other techniques for simulating value are used to establish a nonmarket price.

Priced outputs with market values include timber, firewood, livestock grazing, developed recreation, and commercial fish harvest. Priced outputs with nonmarket values include wildlife oriented recreation and other dispersed recreation.

Timber values are based on prices purchasers historically have paid for timber on this Forest. They vary by species and tree size. Firewood, special uses and mineral leases are also valued in terms of fees actually paid for these goods and services.

The nonmarket values for recreation, including hunting and fishing, are based on studies that have been done asking people how much they would pay for these resources, as well as the 1985 RPA Program. They are tailored to the Pacific Northwest Region and take into account different types of recreational activities available on the Forest and the quality of these activities.

Nonpriced Outputs

Nonpriced outputs are those for which there is no available market transaction evidence and no reasonable basis for estimating a dollar value. Examples of nonpriced outputs include protection of threatened and endangered species and cultural resources and providing natural scenery.

Although present net value is used to compare the net value of priced resources in the alternatives, nonpriced outputs and environmental quality are also taken into account. As indicated above, net public benefit includes both priced and nonpriced resource outputs.

Economic Comparisons of Alternatives

This section discusses the economic consequences of alternatives. It begins with a comparison of variations in PNV among the alternatives. Net cash flows, costs, receipts, and noncash benefits are then examined

Present Net Value

The proposed alternatives are ranked by decreasing PNV in Table II-29. The figure displays the PNV and the total discounted costs and benefits of each alternative. The change in PNV estimates the net economic value that would be foregone if a lower ranked alternative is selected over the previous one.

Discounted Benefits

Table II-30 lists the approximate contribution of the timber and recreation programs to the alternatives' PNVs. These are the primary components of the 150 year PNVs shown in the previous table. Direct comparisons of benefits and costs by individual resource groups provide broad indications of relationships, but these may be misleading because many costs of multiple-use manage-

Table II-29 Present Net Value and Discounted Costs and Benefits of Alternatives (MM 1982 $)

Max PNV Benchmark	Alternative							
	NC	C	E	A	Q (Preferred)	I	F	H
PNV	1,227.6	1,106.8	971.0	910.6	676.3	613.7	596.4	405.5
Discounted Costs	140.7	134.0	119.4	117.4	110.5	88.0	99.9	89.0
Discounted Benefits	1,429.8	1,299.1	1,095.6	1,116.1	869.6	821.0	806.5	620.4

ment are not separable. Once again, the alternatives are listed in order of descending PNV.

The recreation benefits listed in Table II-30 pertain to fish, water, and wildlife outputs to which monetary values have been assigned. This includes the value of fish caught commercially and the value of recreational experiences related to fish and wildlife. Appendix B of the Final EIS provides details of unit costs and values.

The value of benefits produced by recreational investments is estimated to be what visitors are willing to pay for their experiences. These values appear in the Forest Service document "Economic Analysis Revision of November 10, 1983, Regional Direction Package", April 27, 1984, and Appendix B of this DEIS.

Discounted Costs

Total Costs

Total costs are the sum of variable costs and fixed costs. Total costs are shown in Table II-31. Variable costs have been separated into those which primarily pertain to the timber program, engineering, the recreation program, and other programs. Costs of these other programs are disaggregated further in Table II-31.

Timber Costs

They include Knutson-Vandenberg (KV) funds, brush disposal funds (BD), and support from other functions. This support amounts to about 10 percent of the total timber costs and includes timber sale consulting by experts on fish, wildlife, soil, water, fire, geology, recreation, visual, and cultural resources. They do not include costs of timber roads or engineering.

Road Costs

They include the costs of timber roads.

Recreation Costs

Costs for recreation for all alternatives reflect the provision of a "standard" level of service. These costs are about 50 percent higher than what the Forest has received on average for the past 10 years. Under reduced funding levels, quality levels associated with this "standard" service cannot be provided.

Wildlife Costs

These costs include those items required to run the wildlife program on the Forest, including monitoring.

Other Costs

This category includes all the other costs incurred by the Forest, including range management, the minerals program, and administration and overhead. Costs not incurred by the Forest, such as purchaser road credits, are not included.

Cash and Benefit Flows

Cash receipts and budget costs measure actual flows to and from the U.S. Treasury. Market resource values which result in actual cash returns include timber, campground use, livestock grazing, and special use permits. Livestock grazing and campground use include actual cash receipts as well as noncash benefits.

Nonmarket resources which produce noncash benefits include dispersed recreation, wilderness, and wildlife. The purpose of assigning dollar values to noncash benefits is to reflect a resource's total economic benefit even though none or only part of the total value is collected as cash receipts under current laws and regulations.

Net cash flows, cash receipts, and noncash benefits are displayed in Table II-31. More than 99 percent of the total receipts are produced by timber harvest, so only these receipts are shown.

Table II-30 Present Net Value and Discounted Costs and Benefits by Resource Groups[1] 1982 MM$

	Alternative							
	NC	C	E	A	Q (Preferred)	I	F	H
Present Net Value	1,227.6	1,106.8	971.0	910.6	676.3	613.7	596.4	405.5
Discounted Benefits								
Timber	1,230.7	1,100.0	897.9	919.8	674.9	622.4	619.5	415.0
Recreation	199.1	199.1	197.7	196.3	194.7	198.6	187.0	205.4
Discounted Costs								
Timber	46.6	41.2	35.3	32.4	31.0	16.9	24.3	17.2
Roads	21.1	18.7	16.0	14.7	14.1	7.6	11.0	7.7
Recreation	24.6	24.6	24.0	24.0	22.2	20.5	21.6	21.1
Wildlife	10.7	11.4	7.8	9.3	7.1	7.1	7.1	7.1
Other	37.7	38.1	36.3	37.0	36.0	35.9	35.9	35.9

[1] *Direct comparisons of benefits and costs by individual resources provides broad indications of relationships, but they may be misleading because many costs are nonseparable under multiple use management.*

Table II-31 Average Annual Cash Flows and Noncash Benefits in the First and Fifth Decades by Alternative [1] 1982 MM$

	Alternative							
	E	NC	C	A	I	Q (Preferred)	F	H
Decade 1								
Net Receipts	11.4	2.7	0.5	-3.1	-4.8	-9.7	-11.7	-16.3
Total Costs	49.4	58.3	55.4	48.6	36.5	45.7	41.4	36.9
Total Receipts	45.5	61.0	55.9	45.5	31.7	36.0	29.7	20.6
Noncash Benefits to Users	80.7	82.6	82.2	80.7	81.4	80.0	76.6	84.7
Decade 5								
Net Receipts	12.5	25.4	17.2	13.0	15.3	9.1	2.3	-7.6
Total Costs	49.4	58.3	55.4	48.6	36.5	45.7	41.4	36.9
Total Receipts	61.9	83.7	72.6	61.6	51.8	54.8	43.7	29.3
Noncash Benefits to Users	84.1	83.6	83.6	83.6	85.6	83.2	79.7	88.0

[1] *Cost include only those of the Forest Service; receipts do not include payments to counties.*

All alternatives show positive cash flows to the U.S. Treasury during the first decade except Alternatives A, Q, F, H, and I. Net receipts vary from $11.4 to minus $11.7 million. This variation is primarily due to changes in the volume, species mix, and size class of timber harvested in conjunction with the costs of harvesting the timber.

By the fifth decade, total costs usually decrease and noncash benefits increase. The cost decreases are due to less expenditures to rehabilitate recreational facilities and, in the case of departures, less timber being sold. The increase in noncash benefits is due to increases in the number of recreationists visiting the forest.

Major Tradeoffs Among Alternatives

This section summarizes relationships among economic and community effects discussed in this chapter and responses of alternatives to ICOs discussed in Chapter I and Appendix A. The purpose is to highlight major tradeoffs or differences among alternatives. Complete discussions of differences are found in previous sections of this chapter and in Chapter IV.

To provide a framework for assessing these tradeoffs, long-term national, regional, and local resource demands or needs are briefly summarized (more detail is provided in Chapter III). Also, selected economic values and indicators of responsiveness to major ICOs are displayed in Table II-32. Finally, differences and similarities among individual alternatives are summarized.

Comparison of tradeoffs among alternatives must consider the entire array of nonpriced benefits, relationships between priced and nonpriced benefits, and qualitative nonpriced benefits relative to present net value. Comparison of alternatives within this framework forms an indicator of the net present benefit associated with each alternative.

National, Regional, and Local Concerns

The management of the Mt. Hood National Forest has implications for national, regional, and local concerns. For example, RPA timber output targets assigned to the Forest reflect the anticipated needs of national and international markets for wood products. Decisions influencing the scenic quality of the Forest and its ability to provide an adequate supply of diverse recreation opportunities are of importance to regional and local residents who are the primary users of recreation resources on the Forest.

Consequently, the Forest planning process revolves around the development of alternative ways of addressing identified issues, concerns, and opportunities. In fact, the primary difference among the alternatives is the way they respond to the issues. Twelve issues were identified during the planning process; these are discussed in Chapter I and Appendix A of the FEIS. The issues are used in the discussion on trade-offs to help highlight the differences and trade-offs among alternatives.

Major Public Affected

Several groups are affected by management decisions on the Mt. Hood National Forest. Different groups have different interests and concerns. It is possible that a decision that one group would consider positive to their interests would be considered negative by another group. This is discussed in more detail in Chapters III and IV of the FEIS. The following outlines the key groups most affected by management on the Forest:

User Group	Nature of Impact	Impacts by Alternative
Wood Products Workers	Jog Loss or Gain	Alternatives NC, E could increase employment opportunities; Alternative C could have a job decrease; Alternatives A, F, H, I, Q could cause large job losses.
Recreationists	Quality and Quantity of Recreation Available	Quantity of most experiences about the same in all alternatives. Quality of experiences would tend to be better in Alternatives E, F, H, I, Q. Perception of Quality depends on type of experience sought.
Native Americans	Varied	The availability of traditional resources would decline under alternatives NC, A, C, and H; somewhat more resources would be available under Alternatives E, F, and Q.
Long Distance Users	Varied	Scenery, water quality better under amenity alternatives. Those who depend on the Forest as a reliable source of commodities would be better off under NC.

Economic Values and Responses to Major Public Issues

Alternatives differ because they respond differently to the issues and concerns. This section discusses many quantifiable indicators of those responses. It also discusses indicators of central concern to the nation as a whole, as owner of this Forest. FEIS, Chapter I and appendix A fully discuss ICOs and their indicators.

In Table II-32, key quantitative indicators are used to illustrate the degree of responsiveness of each alternative to ICOs, and trade-offs between resources. Alternatives are listed in descending order of PNV, which more directly illustrates resource and economic tradeoffs. The first five indicators respond to the national concern that this Forest is managed in a financially prudent manner while quality of the physical environment is protected and enhanced. Indicators of economic consequences are:

- economic efficiency (measured by PNV)
- net cash flow in the 1st and 5th decades
- noncash benefits in the 1st and 5th decades

Other displays in Chapter II and discussions in Chapter IV and Appendix B provide more detailed information about specific effects and tradeoffs. See Table II-1 in this chapter for present conditions.

Differences and Similarities of Alternatives

Each alternative would meet MRs and multiple-use and sustained-yield requirements at some level of acceptability. Within these limitations, the goal of each alternative is to benefit one or more resource outputs (compared to existing conditions). To achieve this, other resource outputs must be limited or "traded off" (i.e. what potential benefits would be foregone to respond to issues emphasized in that alternative). These tradeoffs are discussed for each alternative. Alternatives are discussed in order of decreasing PNV.

Alternatives A through H would meet MRs and multiple-use and sustained-yield requirements. Alternative NC does not incorporate MRs and consequently would not provide sustained yields of many resources.

Tradeoffs Among the Alternatives

Alternative NC

This alternative has the highest present net value ($1,227.6 million) because it proposes a high level of timber harvest over the life of the Plan. The allowable sale quantity under this alternative would be 313 MMBF in the first decade with a LTSYC of 51.6 MMCF.

This alternative would trade off higher levels of timber harvest for lower levels of old growth, lower habitat capability levels for many species of wildlife, and less emphasis on water quality and riparian habitat. Table II-32 shows specific levels of output for all these indicators by alternative.

Many recreation-related indicators, such as developed sites and Wild and Scenic Rivers would be similar across all alternatives; however under Alternative NC more of the Forest would be roaded so more road-related recreation opportunities would be available.

This alternative would produce a positive cash flow of $2.7 million per year in the first decade and a positive non-cash benefit flow of $82.6 million per year. Approximately 2906 total jobs would be created and payments to counties would increase. This would benefit the wood products industry but would cause increased conflict with amenity users.

Alternative C

This alternative has a present net value of $1,106.8 million. The allowable sale quantity under this alternative would be 282 MMBF in the first decade with a LTSYC of 46.4 MMCF.

This alternative would trade off higher levels of timber harvest for lower levels of old growth, lower habitat capability levels for many species of wildlife, and less emphasis on water quality and riparian habitat. Table II-32 shows specific levels of output for all these indicators by alternative.

Many recreation-related indicators, such as developed sites and Wild and Scenic Rivers would be similar across all alternatives; however under Alternative C more of the Forest would be roaded so more road-related recreation opportunities would be available.

This alternative would produce a positive cash flow of $0.5 million per year in the first decade and a positive non-cash benefit flow of $82.2 million per year. Approximately 1977 total jobs would be created and payments to counties would increase. This would benefit the wood products industry but would cause increased conflict with amenity users.

Alternative E

This alternative has a present net value of $971.0 million. The allowable sale quantity under this alternative would be 317 MMBF in the first decade with a LTSYC of 37.6 MMCF.

This alternative would trade off higher levels of timber harvest in the first decade of the Plan for lower levels later on. Levels of old growth, habitat capability levels for many species of wildlife, and emphasis on water quality and riparian habitat would fall in about the middle of the range for all alternatives. Table II-32 shows specific levels of output for all these indicators by alternative.

Many recreation-related indicators, such as developed sites and Wild and Scenic Rivers would be similar across all alternatives.

This alternative would produce a positive cash flow of $11.4 million per year in the first decade and a positive non-cash benefit flow of $81.1 million per year. Approximately 2561 total jobs would be created and payments to counties would increase. This would benefit the wood products industry in the short-term but would cause increased conflict with amenity users.

Alternative A

This alternative has a present net value of $910.6 million. The allowable sale quantity under this alternative would be 225 MMBF in the first decade with a LTSYC of 38.9 MMCF.

Over the life of the Plan, this alternative would trade off higher levels of timber harvest for lower levels of old growth, lower habitat capability levels for many species of wildlife, and less emphasis on water quality and riparian habitat. Table II-32 shows specific levels of output for all these indicators by alternative.

Many recreation-related indicators, such as developed sites and Wild and Scenic Rivers would be similar across all alternatives; however under Alternative A more of the Forest would be roaded so more road-related recreation opportunities would be available.

This alternative would produce a negative cash flow of $3.1 million per year in the first decade and a positive non-cash benefit flow of $80.7 million per year. Approximately 1452 total jobs would be created and payments to counties would decrease. This would benefit the wood products industry but would cause increased conflict with amenity users.

Alternative Q

This alternative has a present net value of $676.3 million. The allowable sale quantity under this alternative would be 189 MMBF in the first decade with a LTSYC of 31.9 MMCF.

This alternative attempts to provide a balance of outputs. Compared to historical outputs, it would trade off lower levels of timber harvest for higher levels of old growth, higher habitat capability levels for many species of wildlife, and more emphasis on water quality and riparian habitat. Table II-32 shows specific levels of output for all these indicators by alternative.

Many recreation-related indicators, such as developed sites and Wild and Scenic Rivers would be similar across all alternatives.

This alternative would produce a negative cash flow of $9.7 million per year in the first decade and a positive non-cash benefit flow of $80.0 million per year. Approximately 964 total jobs would be created and payments to counties would decrease. This would benefit the recreation industry but could cause increased conflict with timber industry.

Alternative I

This alternative has a present net value of $613.7 million. The allowable sale quantity under this alternative would be 165 MMBF in the first decade with a LTSYC of 27.5 MMCF.

This alternative would trade off lower levels of timber harvest for an emphasis on wildlife habitat and, to a lesser degree, other amenity resources. Table II-32 shows specific levels of output for all these indicators by alternative.

Many recreation-related indicators, such as developed sites and Wild and Scenic Rivers would be similar across all alternatives; however under Alternative I less of the Forest would be roaded so more primitive and semi-primitive recreation opportunities would be available.

This alternative would produce a negative cash flow of $4.8 million per year in the first decade and a positive non-cash benefit flow of $81.4 million per year. Approximately 211 total jobs would be lost and payments to counties would decrease.

Alternative F

This alternative has a present net value of $596.4 million. The allowable sale quantity under this alternative would be 154 MMBF in the first decade with a LTSYC of 25.8 MMCF.

This alternative would trade off lower levels of timber harvest for higher levels of recreation. Higher levels of other "amenity" resources, such as wildlife and water quality would be provided as well. Table II-32 shows specific levels of output for all these indicators by alternative.

Under this alternative more primitive and semi-primitive recreation would be available.

This alternative would produce a negative cash flow of $11.7 million per year in the first decade and a positive non-cash benefit flow of $76.6 million per year. Approximately 461 total jobs would be created and payments to counties would decrease.

Alternative H

This alternative has the lowest present net value ($405.5 million) because it proposes the lowest level of timber harvest over the life of the Plan. The allowable sale quantity under this alternative would be 108 MMBF in the first decade with a LTSYC of 18.1 MMCF.

This alternative would trade off lower levels of timber harvest for higher levels of old growth. This would also result in higher habitat capability levels for many species of wildlife, and more emphasis on water quality and riparian habitat. Table II-32 shows specific levels of output for all these indicators by alternative.

Many recreation-related indicators, such as developed sites and Wild and Scenic Rivers would be similar across all alternatives; however under Alternative H less of the Forest would be roaded so more primitive and semi-primitive recreation opportunities would be available.

This alternative would produce a negative cash flow of $16.3 million per year in the first decade and a positive non-cash benefit flow of $84.7 million per year. Approximately 106 total jobs would be created and payments to counties would decrease. This would cause increased conflict among different users who have different goals for the Forest.

Chapter III

Affected Environment

CHANGES BETWEEN DRAFT AND FINAL

Chapter III has been revised and updated in several important ways. Among the highlights:

- The entire Wildlife section has been rewritten, and is now composed of separate sections for *Management Indicator Species, Snags and Downed Woody Material*, Northern Spotted Owl, and Threatened, Endangered and Sensitive Animals.
- Groundwater aquifer recharge information has been incorporated into Water section.
- A new Biological Diversity section has been added, and addreses forest fragmentation.
- A separate Old Growth section has been added, and includes discussion on old growth definition and a map of Forest old growth areas.
- The Recreation section has been greatly expanded and updated.
- In the Communities section, the Mt. Hood economic influence area has been expanded to include Washington and Yamhill Counties.

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Chapter III - Affected Environment

Introduction

Chapter III takes a look at the Mt. Hood National Forest as it is today. The Forest consists of many resources, such as wildlife, fish, recreation opportunities, timber, drinking water, and others. However, the Forest is much more than the sum of its resources. It is a very complex and dynamic system. With the Forest as our teacher, we have begun to learn about the interrelatedness of all parts of the forest. Chapter III, Affected Environment, is a reflection of this knowledge.

In response to the concerns of our public, Chapter III has undergone major revisions since the Draft. These changes are summarized on the facing page.

The first half of Chapter III is entitled Physical and Biological Environment, and lays the descriptive groundwork of the Forest. Beginning literally from bedrock, these sections build up to more biologically complex topics such as Research Natural Areas and Biological Diversity.

People are an equally significant Forest resource. Small communities survive on Forest products, and an increasing number of urban dwellers recreate here. The second half of Chapter III is called the Human Environment, and focuses on the people that use and enjoy the Forest in many different ways.

The Forest Plan alternative that is selected as the Final Plan will effect the Forest environment in its entirety. This includes members of the sparsely populated surrounding communities, residents of urban Portland, and the wildlife that make the Forest their home. It is hoped that the armchair Forest tour provided by Chapter III will assist the reader in thoughtfully examining the FEIS alternatives.

Physical and Biological Environment

Geologic Setting

Background: Geological Processes

The normal way to see the Forest is from the ground up. Giant, centuries-old trees stand watch. Alpine lakes sparkle under the sun. Snow blankets endless slopes. Water cascades over rock cliffs or flows toward the Pacific. But the surface is not the complete Forest. To see the Forest as it really exists, to see both its strengths and its fragilities, one must look beneath the surface to see the geologic origins which make the Forest what it is today.

Peaks, cliffs, and slopes give the Forest many of its most appealing features. It sits astride the Cascade Mountains, the major mountain range of the Pacific Northwest. Powerful earth movements, in never-ending geologic processes, formed the Cascades by pushing up the bedrock underlying the earth's surface. As this went on, red hot lava poured through volcanic openings.

Through time immemorial, the bedrock has uplifted and folded. Where these irresistible forces were too powerful for the rock to hold, it fractured along lines to form geologic structures called faults. Since faults are geologically weaker than other surface structures, lava and water typically follow fault lines. The Clackamas River flows in direct correlation with major fault lines now existing on the Forest. The volcanic peak of Mt. Hood also correlates with a major fault line.

As geologic processes build up, they also tear down. In some places on the Forest, these processes work invisibly building up mountains. In other places, weathering and erosion chew away at mountains, and gravity transports the resulting rubble to locations below. A basic characteristic of erosion is the movement of weathered rock materials from one place to another in movements sometimes so gradual they are imperceptible. Other movements of materials can be sudden and violent. Few phenomena are more violent than landslides and floods. As this suggests, the important agents of erosion are water, ice, and gravity.

Erosion by water can result in geologic spectacles human beings find extremely beautiful. Columbia Gorge is a classic example. Two powerful geologic forces combined to create this magnificent structure. The first force was a series of enormous floods occurring over centuries. The second was a simultaneous and gradual uplifting of surrounding landforms. Erosion by glaciers - large masses of flowing ice - produce different effects than those caused by flowing water. Streams and rivers cut narrow, V-shaped valleys. Glaciers carve out wide U-shaped valleys. Both types of valleys can be seen along the Clackamas River drainage. In higher elevations, the river flows through an ancient glacial valley known as Big Bottom. As the water continues along its downward course, it leaves behind the glacial U-shaped valley and enters the lower elevation's V-shaped valley.

Ice and flowing water are also involved in another form of erosion; however, the driving force of mass wasting, or landslides, is gravity. Landslides occur regularly and naturally in mountainous terrain like that found on the Forest as one of nature's means of moving soil and rocks from upper levels to bottom lands and stream channels. However, these movements can also be accelerated or magnified by human activities. Mass wasting is therefore an important consideration in the development of the Forest's management programs.

Existing Situations: Natural Features

The geological processes which formed the Forest created an unusual assemblage of peaks, slopes, valleys, and waters. At the Columbia River, the Forest is only 65 feet above ocean level. From that level, the land climbs steadily toward Mt. Hood until it soars more than two miles skyward. At 11,235 feet high, this peak is the tallest point in Oregon and one of the tallest points in the Northwest. Westward from Mt. Hood, areas bordering the Willamette Valley consist of gentle, tree-covered slopes. From these slopes, the terrain grows ever more rugged as it rises toward the Cascade crest. At higher elevations in the central areas of the Forest, high volcanic peaks and cones overlook glaciated valleys and rolling terrain. East of the Cascade crest, the terrain slopes more gently as the elevation falls toward the drier, desert-like areas of central Oregon.

Management Concerns: Earthquakes and Landslides

For all practical purposes, earthquakes are not a major hazard on the Forest. Volcanic activity in and around the Forest, in spite of the recent volcanic activity at Mt. St. Helens, has been comparatively insignificant for more than 200 years. Volcanic eruptions to some degree are always a possibility, but there are no present signs that such activity is resuming. Crandell (1980) investigated the scope and magnitude of a potential eruption on Mt. Hood in detail, and presented his findings in U.S. Geological Survey Bulletin Paper No. 1492.

Landslides are a more serious matter; in some areas the risks are high. The accompanying table shows combinations of conditions which create a high risk of land instability.

Landslides are categorized by the following descriptions (Table III-1):

Debris Flow. These landslides are rapid moving masses of rock fragments, soil and mud, with more than half the particles being larger than sand size.

Debris Slide. These occur on shallow unconsolidated soil and rock debris; they move very slow to rapid from higher elevations to lower elevation areas. Field reviews and inventories have identified areas with a high risk of debris slides. Timber harvesting and road building in such areas would increase the danger of landslides. Since the early 1970's, forest planning has emphasized more strategic road locations and encouraged the building of retaining walls and drainage structures. The number and seriousness of debris slides have been reduced significantly.

Slump. These failures are slow and more deep-seated resulting in slow to moderate rates of movement. An independent mass of rock or earth moving along a curved slip surface. Result is a reversed slope facing uphill. These are generally associated with debris slides or earth flows. They are therefore treated accordingly. A slump that is independent of another landslide will be treated based on such characteristics as size, composition, and rate of movement.

Earthflow. This type of landslide is a mass movement process and land form characterized by a downslope flow of earth and weathered rock. Slopes are usually 30% or less, rate of movement is imperceptable to slow, depth is variable, area can be several acres to several miles in size.

Table III-1 Landslide Categories on the Mt. Hood National Forest

Factor	Debris Slide/ Debris Flow	Slumps	Earthflow
Slope	Moderate to Steep	Gentle to Steep	Gentle to Moderate
Rate of Movement	Rapid, up to 50 ft/sec	Slow to Moderate	Imperceptible to Slow
Area	Debris slides: small, visually under several acres, linear Debris flows: can be tens of acres, linear	Several Acres to Hundreds of Acres	Several Acres to Square Miles
Depth	Shallow (generally less than 30 feet)	Moderate (generally less tan 100 feet)	Deep (generally greater than 100 feet)
Precipitation	Influenced by Individual Storm Events	Influenced by Yearly Precipitation Cycles	Influenced by Prolonged and/or Intense Periods of Precipitation (usually greater than a year)
Mechanism of Failure	Translational (Planar) Subjacent Areas to Debris Slides can Liquify Forming Debris Flows	Rotational	Complex - an earthflow involves elements of rotation and flow; the slumping of coherent material at the head of the slide and plastic flow of subjacent material. Debris slides, debris flows, or slumps can occur locally on the earth flow increasing the complexity of this type of slide.
Frequency and Occurrence of Impacts	Sporadic Gully Washer, Stream Flushing Cycle Debris Slides Usually Occur in Similar Landform Types, Rarely in the Same Location Debris Flows Often Follow Drainages		Varying Levels of Activity Over Centuries Impacts are constant in the Same Location

From Varnes, D.J., Slope Movement and Types and Processes., In Landslides: Analysis and Control, Transportation Research Board, National Academy of Sciences, Washington, D.C., Special Report 176, Chapter 2, 1979.

Many activities which accompany human uses of the Forest's resources can increase the risk of destructive landslides. Disturbing the soils or vegetation in sensitive areas is a risk factor. Timber harvesting involving road building or similar soil-disturbing actions is another. Because landslides can cause the loss of capital investments, facilities, and the loss or degradation of natural resources, the impact of various programs on each type of land movement is a basic management concern.

Inventories have identified 53,000 acres of active and stabilized earthflow areas on the Forest. Of the total acreage, 18,900 acres of active earthflow are suitable for timber harvest. The Clackamas, Collawash, Oak Grove Fork, Hot Springs Fork, and Fish Creek watersheds contain deep-seated, slow-moving earthflows. Some of these earthflow areas can cover thousands of acres. Map III-1 shows the locations of earth flows on the Forest.

Current evidence shows that slope stability correlates with increased pore water pressure content. Not surprisingly, the steeper the slope and the more water it contains, the higher the risk of instability. Since the removal of forest cover can increase the soil's pore water pressure, it follows that removing forest cover can increase the danger of earth movements. Activities on small parts of an earth flow affect not only the immediate area, but also the entire earthflow. In the past, project planning and assessments have often been based on site-specifics instead of area-wide planning and a uniform management policy. To cope with possible cumulative effects of different projects on an earthflow, special management practices must be followed to reduce or eliminate the danger of reactivation or acceleration of destructive soil movements.

Geologic Features and Hazards in Relation to the Natural Environment

Many scenic attractions of the Forest are the consequence of eons-old geologic processes. The basalt cliffs of the Columbia Gorge and the Clackamas River drainage are spectacular natural features. Little Crater Lake is a unique geological structure set aside as a Special Interest Area. Two other geologic areas of high interest are Bagby Hot Springs and Parkdale Lava Beds. Both of these areas have been considered for designation as Special Interest Areas.

Soil composition and productivity are directly related to the weathering of bedrock material at the site, or the deposit of material produced by erosion. Parent bedrock determines the mineral and physical content of the Forest's soils.

Aquatic resources, including fish, reflect past and present geologic processes. Landslides are a major cause of sediment deposits in the Forest's streams. Sediment can adversely affect fish in the short term, but sediment gravels can be a source of spawning gravels for anadromous fish in the long term. (A section of this chapter entitled FISH provides additional information.)

Timber is another natural resource adversely affected by active landslides. Timber and timber producing lands can be lost when slides occur, and trees which manage to grow on slow moving earth flows are often twisted and jackstrawed. Geologic forms that affect wildlife include talus slopes, caves, rims, and ledges. Such geologic structures provide habitats for wildlife species like bats, swallows, and similar wildlife.

Mineral and rock resources found on the Forest are primarily used in timber activities. Some high quality rock for road construction is located in west side drainages; other minerals and rock are located in bedrock and surface deposits. The highest potentially leasable mineral resource is geothermal energy. Known Geothermal Resource Areas (KGRA) have been identified on the Forest by the U.S. Geological Survey. Locations include Mt. Hood, the Cary/Austin Hot Springs, and Brientenbush. More detailed information is provided in the section of this chapter entitled Minerals and Energy Management.

Geologic hazards on the Forest include floods, landslides, and rock falls. As mentioned earlier, volcanic eruptions and earthquakes appear to be minor threats. However, landslides can be catastrophic as in the Pollalie Creek debris flow in 1982. This flow destroyed a campground and killed one person. Other geologic hazards can be triggered by sudden or extreme changes in the environment, such as unusually high rains or blizzards. Rock falls are common hazards on some forest roads under freeze-thaw weather conditions. Other hazards can be affected by management programs. Some rockfall and landslide hazards have been reduced by installing barriers and chainlink blankets in high risk areas. A basic management concern is finding ways to modify, restrain, or prohibit any activity that could increase geologic hazards.

Soil Resources

Background

Five factors interact with each other to determine the quality of soil in different forest locations. The first factor is the parent material, which is the rock from which the soil evolved. Additional soil determinants are climate, topographic features, the type of vegetation grown in the soil, and the length of time that environmental variables have acted on the parent material.

The differences in the Forest's climate have produced three fairly well-defined Forest zones. Ponderosa pine forests predominate the drier east side. Western hemlock forests are dominant on lower elevations of the mild, wet, west side. True fir and mountain hemlock predominate the cold, higher elevations. The upper layers of soil in each of these vegetative zones demonstrate how climate and vegetation interact to develop the characteristics of soil quality. The types of parent material beneath the surface layers of soil are relatively uniform, volcanic rock. However, the Forest supports a diverse plant kingdom.

Existing Soil Conditions

The major types of soil on the Forest were identified and defined in a soil survey that was completed in 1979. The scale of the survey map is one inch equals one mile. The survey described 149 soil map units that were determined to respond differently to timber harvesting and road construction. The greatest use of a small scale survey is in overall planning, such as the development of the forest plan. Efficient planning of individual projects requires site-specific soil information. At this time, less than five percent of the Forest has been surveyed intensively. However, present management direction has identified the need for accurate soil information to implement the Forest's programs. Domestic watersheds have received the highest priority for intensive soil surveys.

Soils within the Western Cascade Province on the west side of the Forest tend to have the highest fertility levels, but they also exhibit the highest potential erosion and compaction hazards. These soils developed in material weathered from the older, volcanic, pyroclastic flows and breccias. The accumulation of organic matter, and a well developed structure, typify surface soil horizons.

Soil types that occur at higher elevations along the Cascade crest developed out of younger Cascades andesite rocks. Weakly developed structure and poorly expressed soil horizons are typical.

Fertility levels in higher elevation soils are low. This is particularly true on sites that are dominated by Pacific rhododendron. Historically, destructive wildfires have reduced fertility levels on certain lands on the Forest. Erosion and compaction hazards for these soils are moderate. Valleys in some high elevations of this region experienced relatively recent glaciation.

A combination of wind-deposited sand and silt-sized material creates a mantle over the parent rock of the soils that are east of the Cascade Crest. The northeastern section of the Forest has the deepest surface deposits. In the southeastern areas, deposits of glacial till dominate the soil landscape, and surface deposits are thinner. For all soil types east of the Cascade Crest, the erosion hazard is moderate to high, and the compaction hazard is moderate.

Soil Productivity. The productivity, or site quality, of a parcel of land is determined by the way the soil and other environmental factors affect each other. The key environmental elements are precipitation, aspect (slope orientation), and air/soil temperatures. Soil temperature and biological activity are closely interrelated. For this reason, soil temperature vitally influences overall soil productivity. The following factors define the moisture-holding capacity and nutrient qualities of soil, and determine its productivity:

- Effective soil depth. This is the difference between total rooting depth and volume of rock in the profile.
- Depth of the A horizon. This is a mineral soil layer characterized by accumulated organic material.
- Clay content in the soil layers below the A horizon.

Soil Moisture. Since precipitation is comparatively low on the east side of the Forest, soil moisture retention exerts an unusually high influence on site productivity. Effective soil depth and texture also largely determine the moisture available to support plant growth.

Nitrogen. This is an essential element in soil productivity. Nitrogen available for plant use is closely related to the soil's organic content, and the rate at which decomposition of organic matter releases it. Its availability is generally accepted as a limiting factor of Douglas-fir growth in the western interior portion of its geographical range. On better quality soils nitrogen levels can exceed .2 percent. On lower quality soils nitrogen levels are less than .1 percent.

East of the Cascades, nitrogen levels become less important to productivity as soil moisture and rainfall decreases down to the pine/oak type of vegetation. Above 3,500 feet, timber productivity declines as cooler soil temperatures reduce the rates of nitrogen mineralization of the surface organic layer. Conservation of nitrogen reserves located in the surface organic layer becomes more important as elevations increase.

Compaction. Soil productivity can be seriously reduced by timber harvesting activities which alter surface soil qualities. One of the most critical results of timber harvest activity is soil compaction.

All soils can be compacted if they are given sufficient impact and moisture. However, those with moderate textures are most susceptible. Approximately 420,700 acres on the Forest are classed as moderate or severe in their susceptibility to compaction. 30,000 acres have suffered some degree of compaction because of past timber harvests.

Soils are compacted when heavy objects are moved or dragged across their surfaces. Tractor ground skidding and machine piling of slash are typical examples of compactive forces. Under these pressures, soil bulk densities increase within the skid trail system, and adjacent to piled slash. The soil structure breaks down. Soil particles pack together, and large pore spaces shrink. Infiltration rates decline and soil strength increases. Higher soil strengths restrict small root penetration within the soil medium. Ultimately this leads to reduction of moisture and nutrient uptake by conifer seedling root systems.

Information gathered over five years discloses that tractor operations are more common on the east side than on the west side of the Forest. One reason for this is that eastern districts have more terrain on slopes that are less than 30 percent. Forest slope inventories indicate that 72 percent of the land in Barlow, Bear Springs, and Hood River Districts has slopes less than 30 percent. During the monitored period, 70 percent of east-side districts were tractor-yarded; this figure compares to 27 percent for west side districts. The average tractor-harvested acreage over the five years was 1,170 for the west, and 1,470 for the east.

Map III-1 Major Earthflow Areas

The compaction that occurred from skidding operations varied from 3 percent to 30 percent of the harvest area on west side units. The lower compaction levels were obtained by using low ground pressure, torsion-mounted suspension equipment. Compaction caused by ground skidding on the east side varied from 9 percent to 30 percent.

Machine piling of slash is often used on tractor-yarded harvest units. It is more economical, and is less damaging to air quality than broadcast burning. On the west side of the Forest, 30 percent of the regeneration harvest acres are usually machine piled. On the east side, 50 percent are machine piled. About 70 percent of shelterwood acres are treated with ground machinery throughout the Forest. In harvest units that employ both ground skidding and machine piling, compaction ranged from 14 percent to 36 percent on the west side, and from 10 percent to 47 percent on the east side. Although little field data is available to measure compaction caused by machine piling, preliminary information indicates that additional compaction is about 8 percent to 9 percent. Several factors, including the equipment used, soil types, moisture characteristics, the amount of residual fuels left after logging, and contract specifications, help to explain variations in monitoring results.

Past monitoring indicates various ways that compaction can be a factor in timber sales. The data is best viewed with reference to the east-west differences in physical environments; this is particularly true for soil moisture. At this time, no site-specific data has been collected to aid to measure the effects of compaction in relation to tree height growth, or to reductions in plantation volume.

Fire. The impact of fire on soil productivity largely depends on the quantity of the surface organic matter consumed, and the intensity of heat transferred into the soil profile. Fire releases nitrogen to the atmosphere, while it leaves the majority of other nutrients in the ash residue. It can also lead to surface erosion of disturbed sites. A total loss of the organic layer from a fire would cause a serious loss of nitrogen in soils of low fertility. The risk of losing the entire organic layer increases when site preparation employs a crawler tractor to rake and push slash into piles for subsequent burning. If burning produces an extreme loss of surface nitrogen, soils with a high nitrogen content would recover with greater resiliency. The cooler spring burns on the Forest normally consume only the upper, drier undecomposed section of the organic layer, and leave behind sufficient organic material for future nitrogen cycling.

Erosion. The primary effect of erosion on soil productivity is the loss of fertile top soils. West of the Cascades, soils with the highest potential for loss from erosion are those that developed from pyroclastic rock types. East of the Cascades, soils with surface mantles of volcanic ash and wind-blown deposits have high erosion hazards. Throughout the Forest, undisturbed forested soils have the lowest natural erosion rates, but it is impossible to avoid some degree of surface soil exposure when management activities are conducted. The results of this exposure varies with location and activity. Surface soil exposure that has occurred during cable logging has not caused unusual soil loss on the Forest. However, skid trails with reduced infiltration rates caused by heavy compaction have shown the degrading consequences of erosion and overland water flow. The potential for soil loss by erosion is of greatest concern during road construction, and on slopes that have lost their protective vegetative cover from road cuts.

It is generally agreed that excessive soil erosion reduces future soil productivity, and deposits sediment into streams. However, the changes in soil qualities have not been applied to predictive models, and have not been quantified in terms of short or long term productivity losses. Well- substantiated data shows that the removal of the surface soil layer will have the following effects:

- Alters soil porosity.
- Alters bulk density.
- Reduces infiltration rates.
- Changes the soil structure
- Changes the soil's composition.

The magnitude and seriousness of these changes are questions that face the Forest management.

Soils in Relation to the Forest Environment

Soils created from parent rocks by never-ending geologic processes are a fundamental part of the biophysical environment. Soil qualities help to determine what species, mix, and vigor of plants can grow at any given time and place. If the physical or chemical properties of the soil change, the types and rates of plant growth will change in response. In the normal life cycle of plants, decomposed or decomposing vegetation contributes organic matter to the Forest's soils, and increases their productivity.

Sediment. Flowing water and rain can break soils down into particles. When these particles are carried within moving water, they produce sediment. Sediment suspended in streams reduces the clarity of water as well as its quality. A high load of sediment can impair a stream's ability to sustain trout and salmon. The natural levels of suspended sediment in streams is partly related to the ratios of clay, sand, and silt found in the soils through which they flow. Soils developed from volcanic rocks are relatively high in clay and silt content. They contribute more suspended particles to the streams than soils that are developed from glacial till, which have a lower percentages of clay and silt. For these reasons, the quality of fish habitat is partially dependant upon the type of soils through which the streams pass.

Fire. As previously noted, fire can impact the Forest's soils in different ways. In some instances, intense fire can alter the soil's physical characteristics and, can impair nutrient cycling. On other occasions, a light burn under relatively moist conditions may return nutrients to the soil, and can stimulate the activities of beneficial microbes by increasing soil reaction and temperatures.

Relationships to the Human Environment and Management Concerns

All outdoor activities have the capacity to effect Forest soils. These include activities with recreational, as well as economic goals. Some examples are:

- All aspects of timber management
- Construction of roads and other facilities
- Maintenance and use of forest facilities and lands
- Mineral and energy exploration
- Range uses
- Native American uses

The planning of forest management resources requires full consideration of soil characteristics. Two fundamental soil characteristics are fertility, and susceptibility to compaction.

These considerations are most evident in timber management. Over the short term, the protection of soil productivity may appear to be contrary to the economic interests of nearby communities, because of increased timber harvest costs. In the long term, however, economic hardships from timber production could be prevented later, by minimizing practices that could damage soil productivity, or those which could cause soil loss from erosion.

Current management direction states that compaction on harvest sites cannot exceed more than 20 percent of the harvest area. This goal may be unattainable if both tractor harvest and machine piling are employed. The standard practice is to reduce soil compaction to the minimum amount that is practical. Some heavily compacted soils are being tilled. However, approximately half of the logging on the Forest continues with tractors, and other ground equipment. This equipment is favored by operators as the most economical method to use, except where cable systems or helicopters are used on steep slopes. These do the least damage to the soil, but are more expensive to operate. The 30,000 acres of compacted soil on the Forest have a corresponding reduction in soil productivity. Detrimental effects of compaction have been known to last at least 40 years, and this damage to the soil has serious implications for future timber production.

A reduction in soil productivity reduces the growth of established trees and makes the regeneration of young trees more difficult. Costly site rehabilitation may be the only way to correct severe site damage. If this level of intense work is not done, trees may not be able to grow on the site for many years. The available choices are to counteract lost soil productivity, or accept the reduced availability of timber for future harvests. Machine-compaction of forest soils can be reduced by broadcast burning of logging debris instead of yarding and piling . Broadcast burning should only be done when air quality standards can be met. Broadcast burning, yarding, and piling are fully described the Fire section of this chapter.

Potential soil compaction or stream sedimentation.

Road construction, like timber harvest activity, has its own risks of damage to the Forest's soils. The major problems are increased erosion, and the sedimentation which follow. These effects are most likely to occur when road building occurs on steep slopes, or on lands that are adjacent to streams, lakes, or wetlands. The current management direction emphasizes steps to prevent excessive erosion and sedimentation.

Recreational activities may impact soils through compaction and erosion. Hikers, horses, and off-road vehicles present the biggest problems, although short-cutting of switchbacks on trails have caused severe damage in some areas.

Mineral and energy exploration, range uses, and Native American uses of the Forest's resources may result in different types of soil degeneration. These effects are usually localized, and should be controlled through close management supervision.

Air Quality

Background

Throughout the centuries before Europeans settled the Pacific Northwest, forest fires caused repeated periods of poor air quality. Some fires were set by lightning, and others were set by people. Regardless of the ignition method, smoke was very much a part of the early Forest scene.

In the 20th century, industry, farming, and transportation became major economic factors in the Northwest. The fires caused by these new activities added pollutants to the air. Although fire suppression has reduced smoke from wildfires in recent decades,the burning of debris that is left from logging slash has been a common forestry practice since the 1940's. In the Willamette Valley, annual grass-burning practices send up large amounts of smoke, which travels to the east side of the Cascades.

Existing Situation

Increased national concern for air quality in the 1960's led to passage of the Amended Clean Air Act of 1970. The provisions of this Act were written to reduce the emissions of major pollutants, including small suspended particles called particulates, into the air. The Act did not prevent smoke from slash and field burning from becoming a heated issue in the Portland Metropolitan Area and the Willamette Valley. Pollutant-carrying smoke from the summer and early fall burnings is often trapped by air inversions, which aggravate the problem. The air inversion lid forms when the air in upper levels is warmer than air that is close to the ground. The warm air "lid" keeps ground-level air from rising and dispersing its load of pollutants. The polluted air just "sits still."

New legislation, in the form of the Clean Air Act Amendments, was enacted in 1977. This law attempts to address the problem of air quality in Class I wilderness areas, and in some National Parks. It establishes three classes of air quality. Class I areas are the most pristine, and little or no degradation of air is quality allowed. The core of the Mt. Hood and the Mt. Jefferson Wildernesses have been designated as Class I. Air quality classifications for the remaining, newly created wilderness areas,are in Class II. Under the 1977 Act, all federal agencies must comply with federal, state, and local procedural requirements for the control of air pollution. As a federal land manager, Mt. Hood National Forest is charged with protecting the quality of its Class I areas. None of the Forest's areas have been designated Class III.

Between 1976 and 1979, the Forest burned an average of 3,900 acres of slash per year. 1976 had the highest burn total of 5,140 acres. The lowest year was 3,420 acres in 1979. An average of 2,000 acres of slash were broadcast burned per year, during this period. Broadcast burning ignites slash as it lays on the ground, instead of being moved into piles before burning.

Air Quality in Relation to the Natural Environment

Effects of Smoke. The impact of smoke on the Forest's vegetation, wildlife, aquatic, and recreation resources is usually temporary. Smoke has been a natural factor in the environment since prehistoric times. There is little difference in pollutants from natural and human caused fires, but there is a difference in the smoke's duration. Smoke from natural causes would normally be confined to short, intense episodes, such as a large forest fire. However, smoke from burning slash, although less in volume, lies over forest areas for longer periods of time. Smoke from field burning in nearby valleys intensifies the effects of slash burning.

Acid Rain and Dust. Acid rain may constitute a potential problem. High mountain lakes are being studied to determine if acid rain now presents any measurable effects. Dust from road construction may impair air quality in local areas, but these are short term conditions and do not require any special mitigation.

Effects of Timber Harvesting. Forest management has four primary options for resolving the slash disposal problem. The least common method is slash piling, by hand, which is expensive, and is only partially effective with heavy material. Yarding of unmerchantable material (YUM) can be expensive, and may reduce wildlife habitat. Machine piling is a method that is often used but heavy machines cause undesirable compaction, sedimentation, and are unsafe to operate on slopes greater than 35 percent. Broadcast burning is a method of slash disposal in which an entire unit (usually a clearcut) is burned over and can be a cost-effective method. When it is properly executed, broadcast burning creates spots for planting, prepares an excellent seedbed, and can dramatically reduce fire hazards.

Fire is a hazardous element in broadcast burning, because of the risk of potential escape. Extremely dry or windy days eliminate broadcast burning as an option, because of the increased escape risk. Rainy or foggy days also prohibit broadcast burning because of ignition difficulty. Atmospheric conditions may limit burn days when there is a danger that smoke will travel to populated or Class I areas.

Air Quality in Relation to the Human Environment. If past events are an indication of future trends, the demand for clean air will intensify. The intensity of the demands may correlate to the expected increases in the populations of metropolitan Portland and the Willamette Valley.

The problem with polluted air is not difficult to define; it can harm people, and can sometime harm them seriously. Very fine particulates can enter the lungs, and remain there indefinitely. Foreign materials in the lungs can cause a variety of diseases, or can aggravate pre-existing disorders. Particulates of any size can combine with other pollutants to create synergistic effects. The potential health hazards from particulates is a reason for their regulation by the Environmental Protection Agency (EPA).

Slash burning, when conducted alone, may not present a serious management situation. However, the severity level increases when it is combined with the pollution caused by burning fields, auto exhaust, and smoke from wood stoves. The pollution caused by wood stoves that are used for heating is a relatively recent development, and has increased significantly within the last 10 years. Slash is a major source of firewood, and the burning of slash in household stoves adds to the air quality problem. The potential pollution from wood stoves has prompted concerns from air quality officials, and presents smoke management problems for the Forest.

Air Quality in Relation to Recreation and Scenic Views. Smoke has a very visible effect on recreation and scenery. If the mountains disappear behind a haze of smoke, there is little scenery remaining to admire. Scenery is a major reason that people choose to live in the region which surrounds the Forest. It is unlikely that local residents would willingly accept a significant loss of scenic quality caused by smoke. Fortunately, the effects of smoke from slash fires and campfires are localized, and they normally disappear within two to six hours.

Air Quality Related Values

The Clean Air Act requires the Federal land manager of Class I wilderness areas to protect the air-quality-related values (AQRVs) from adverse air pollution impacts. AQRVs are the values within the Class I area that could be affected by air pollution. AQRVs for the Class I portion of the Mt. Jefferson Wilderness on the Mt. Hood National Forest are being identified by the Willamette National Forest. The AQRVs for the Class I portion of the Mt. Hood Wilderness are identified below.

Scenery. The summit of Mt. Hood, surrounded by its many glaciers, snow fields, and flower carpeted high alpine meadows, dominates this wilderness landscape. The mountain contains many deep box canyons and rocky gorges, cascading streams, and high leaping falls of icy glacial waters. On western slopes, the eroding westerly winds have created shifting windrows of sand and pumice. The Pacific Crest National Scenic Trail traverses the wilderness, while the timberline trail circles the entire mountain. Below this trail, the scenery changes to heavily timbered slopes of mountain hemlock and silver fir. Mountain climbing, hiking and skiing are the three most important recreational values, and the scenic vistas are the primary attraction.

Odor. Much of the wilderness experience in the Mt. Hood region is influenced by sights, sounds, feelings, experiences, smells that the visitor encounters. In areas close to metropolitan areas, one of the significant changes for the city resident is the smell of the great outdoors. Whether it is a whiff of a fir forest, or briskness of the clean, crisp high mountain air rising up and over the Cascade Range, natural smell is a value that is only appreciated when it is replaced with the odor of civilization.

Flora. The Mt. Hood Wilderness supports a diversity of plants that reflect the health of the environment. Douglas fir is the dominant tree species on the lower slopes. It is followed by western hemlock, pacific silver fir, noble fir, mountain hemlock, subalpine fir and whitebark pine. Beneath the canopy of trees, huckleberry, vinemaple, Oregon grape, salal, rhododendron and devil's club can be found. Their exact locations will vary with the elevation, moisture, and exposure of the site. Chikapin Boxwood, and prince's pine can be found in the drier areas. In late summer near timberline, wildflowers clothe the hillsides and meadows with a bright tapestry of blooms. The following are on the Regional Forester's sensitive species list, and are found along this boundary: Arabis furcata (Cascade rock-cress), Calamagrostis breweri (Brewer's reedgrass), Phlox hendersonii (Henderson's phlox), and Potentilla villosa var parviflora (Villous cinquefoil). Threatened and endangered species of plants that are suspected to occur include: Botrychium lunaria (Moonwort) and Draba aureola (Golden alpine draba).

Salal

Fauna. Close to 150 species of birds, ranging from hummingbirds to bald eagles, have been observed. Forty species of mammals make their home on the slopes of the mountain, and include shrews, bats, marmots, weasels, coyotes, bears, mountain lions, deer and elk. At least fifteen species of amphibians and reptiles are also present. Several species of trout, including the sensitive dolly varden, are found in the glacial streams flowing from the mountain.

According to the May 1989 Oregon Natural Heritage Database on Rare, Threatened and Endangered Plant and Animals of Oregon, the Oregon Slender Salamander (Batrachoseps wrightii) is found under Taxa of Concern in Oregon. It is found on both east and west side of the Cascade range. It has no federal or state protection status. The Oregon slender salamander was last observed in 1983, adjacent to the Mt. Hood Wilderness. It is usually found in the mature Douglas-fir forests on the western slopes of the Cascade Mountains. In also occurs in the recent lava flows near the crest of the Cascades, and in second growth forests. It is largely absent from recently clearcut areas, and has an elevational range up to 15-4500 meters. In early spring months, when the ground is still damp from snow melt, they can be found under bark and logs that are lying on the forest floor. It is also found inside of rotten logs, and retreats to a subterranean lifestyle in late spring and summer.

The Northern Spotted owl was recently listed (June 22, 1990) as a Threatened Species by the U.S. Fish and Wildlife Service. The owl is found throughout western Oregon, on both east and west side of the Cascade range. As a Threatened species, any activities which may destroy habitat for the owl must be presented to the U.S. Fish and Wildlife Service. The Fish and Wildlife Service is charged with the creation of a recovery program for the owl, designed to help remove the owl from Threatened status.

The owls can be found in stands containing large diameter trees, multiple canopy layers, and large dead and down trees, up to an elevation of 5,000 ft. The majority of the Mt. Hood wilderness is considered unsuitable habitat, due to the absence of large diameter trees, poor soil type, and high elevation. The majority of the suitable habitat within the wilderness has been surveyed, and reproduction of spotted owls has been documented in 1990.

Water Quality. The current Class I portion of the wilderness has no lakes, and the fisheries at this high elevation are of little economic importance. However, the area is surrounded by Class II wilderness that has lakes and streams which support riparian habitat and important anadromous fisheries. Some sensitive species are present in these areas. These streams and lakes are poorly buffered, and are fed from above by clean, fresh snow melt. The quality of these streams and lakes is dependant upon snowmelt that is free from acid deposition.

Management Concerns

A Memorandum of Agreement with the Oregon Department of Environmental Quality (DEQ) was accepted in 1968 by State agencies, Federal agencies, and private organizations. It is the model that is used for managing smoke from slash fires. Under the agreement, slash will only be burned in compliance with State regulations, and when atmospheric conditions divert smoke from Portland and the Willamette Valley.

The Class I areas are limited to the core of the Mt. Hood and Mt. Jefferson Wilderness Areas. The core of the wilderness areas is represented by the original designated wilderness, and does not include the newer areas added in the 1984 Wilderness Bill. However, there are additional important constraints. The burning of slash during a prevailing east wind is prohibited on the west side of the Forest, because it would carry smoke into Portland. West winds could blow smoke away from the Willamette Valley, but the smoke could move into Class I areas. Burning conditions are carefully and cooperatively monitored with the Oregon Department of Forestry to assure that requirements are addressed. This reduces the likelihood that smoke from prescribed burns will enter the Willamette Valley, or into Class I areas.

Each summer since 1982, the Forest has cooperated with the DEQ to monitor air quality on the Forest. A device to monitor particulates was placed at Multipor Ski Bowl (Mirror Mountain), and visibility was measured at Hickman Butte Lookout, SiSi Lookout, and Walter's Corner. These sites are near the Mt. Hood, Mt. Jefferson, Bull-of-the-Woods, Badger Creek, Salmon-Huckleberry, and Columbia Wilderness Areas. Results indicated that smoke from slash burning reduced visibility during the sampled times. The study did not determine the origin of the smoke. Haze was evident on many days.

Prior to 1976, there were an average of 105 burn days per year when burning was allowed. Between 1976 and 1979, however, burning was allowed on an average of 52 days per year. During the same period of time, the total amount of slash burned has been reduced from an average of 77 to 44 tons per acre, per year. The reductions occurred because efforts to leave woody debris unburned on the ground, and because of a shift to burn during times when large woody material and forest floor duff are too wet to ignite.

Burn pile ignition.

Technology has been developed to determine the best time to burn, as well as the most efficient use of labor. These advances make it possible to fully use all available burning days. They also provide the most efficient methods of burning slash, reducing smoke problems. The critical period for air quality is July through August, which is the period of greatest recreational use. The Forest has reduced the burnings during this period. From 1983-86, the slash burned during the critical months was only 7 percent of the total amount that was burned during the year. The Forest is up-to-date with its slash treatment schedule, and there is no backlog of unburned slash.

Water

Background: The Importance of Water

Water is an essential component of the Mt. Hood National Forest ecosystem. It moves soil nutrients to the root systems of trees, and transports nutrients throughout plant systems. The presence or absence of water largely determines the forage or timber species that grow on a specific site. Water plays a critical role in the habitat requirements of all wildlife, and influences the distribution and abundance of wildlife populations. Water fosters the growth of vegetation, which anchors topsoil.

The Forest's streams, lakes, reservoirs, wetlands and groundwater aquifers supply one of the Forest's most valuable commodities: water. Approximately 40% of all Oregon residents rely on the Forest for domestic water supplies. Forest water is also extensively used for irrigation, hydropower production, recreation, and fish production. The scenic qualities of waterfalls, streams and lakes add significantly to the beauty of the National Forest.

Forest Overview

The Forest's surface water resources include stream flow in perennial and intermittent channels, lakes, reservoirs, wetlands, and springs. The surface areas of these water bodies are summarized in Table III-2. The surface area of the Forest's lakes, ponds and reservoirs is about 3500 acres.

Groundwater is also an important water resource generated on the Forest. The Forest acts as a groundwater recharge area for aquifers both within and outside the National Forest boundary. These aquifers maintain baseflow conditions for streams and rivers on the Forest and groundwater for domestic and municipal wells.

Table III-2 Bodies of Water on the Forest

Type of Water Body	Surface Area in Thousands of Acres
Perennial Streams (Water flows all year, 1640 miles)	4.0
Intermittent/Ephemeral Streams (Water flows only a few months a year, usually during snowmelt or continued rainfall, 3410 miles)	4.1
Lakes and Ponds	3.5
Seeps and Springs	28.6
Wetlands (Continuous moisture in the areas' soil and vegetation)	31.2
Total Surface Area Occupied by Bodies of Water	71.4

The Forest's five major drainage basins are shown on Map III-2. Viewed from the top of the map, and moving clockwise, they are: Columbia River, Hood River/Mile Creeks, White River/Badger-Jordan, the Clackamas River, and the Sandy River. The forest has approximately 5,050 miles of stream channels. Streams on the Forest have been classified according to use and/or potential use (see Glossary and FSM 2520). Map III-4 depicts the normal classification hierarchy of streams in a "typical" hypothetical watershed.

Streamside management units (SMUs) and riparian zones are associated with these bodies of water. A cross-section of a representative riparian zone and SMU is shown in the table below. Riparian zones are the land areas which border surface water sources and support hydrophilic (water-loving) vegetation. Management activities within riparian areas can directly affect water quality in associated streams, and can affect the habitat provided by riparian vegetation (Brown, 1972).

To ensure that such effects are controlled, the Forest Service has established streamside management units (SMUs) along all Forest streams. SMUs normally encompass the area from the water's edge to the first topographic break outside the riparian zone (and thus include the riparian zone). For each SMU falling within a management activity area (such as a timber sale), a site specific prescription is formulated and applied utilizing "Best Management Practices" to protect or enhance water quality. Where judiciously prescribed and administered, this approach has protected water quality and the inherent values of riparian resources. This has been documented through a long history of water quality monitoring on the Bull Run Watershed.

Riparian zone/SMUs.

The Forest's streamflow regimen is split between east-side/high elevation snowmelt dominated, and west-side/low elevation rain dominated watersheds. In the case of the former (east-side/high elevation), for perennial (year-round) streams, peak flows occur in midspring with subsequent low flows near the end of August. Intermittent streams which flow for only part of the year respond similarly, but are usually dry by the end of July. They carry water only during the snowmelt season or in direct response to precipitation. Ephemeral streamcourses flow water only in direct response to higher than normal snowmelt or abnormally intense or long lasting storms. In these instances, streamflow lasts no more than a few hours beyond the cessation of the storm/snowmelt event. The table below shows a typical hydrologic cycle.

The patterns for other west side areas are similar to the east side systems, and have low flows that occur in mid-August. Peak flows will occur during the heavy rainfall months of November, December, January and February in watersheds below the winter snowpack area.

The surface area of the Forest's lakes, ponds and reservoirs is about 3500 acres.

There are approximately 31,000 acres of wetlands on the Forest. They range from marshy areas with perennial standing water, to seasonally saturated wet meadows. Wetlands provide water to stream systems during the low flow period, filter sediments generated from upslope sites, and provide detention storage of water during flood events.

Floodplains, associated with all stream channels, are the land areas along stream courses that are subject to periodic flooding. Floodplains on the Forest range from small and narrow where streams are confined to narrow canyons, to relative wide areas associated with valleys. A floodplain in good ecologic condition provides an important function during flood events. Once water rises out of the channel banks, these areas provide detention storage of flood water, and at the same time reduce sedimentation by slowing water velocities that cause deposition of sediment to occur.

Hydrologic cycle.

Existing Situation

Water quality on the Forest is generally good-to-excellent at the higher elevations, and good-to-moderate in lower elevations. The range of quality levels is closely related to past management activities, and to the condition of riparian condition that results from these activities. Much of the Forest's upper elevation is in a relatively pristine condition, and includes many acres in wilderness or unroaded condition. This situation changes dramatically from the upper to the lower elevational zones. Intensive management activities have been occurring at the lower elevations for a number of years. Road building, timber harvest in riparian zones, and removal of large woody debris from the channel system have adversely affected water quality and fish production.

Aquatic habitat condition includes water quality, and is dependent on the condition of the riparian zone. The old growth timber component is particularly important. Old growth moderates water temperature by shading the stream surface. After it falls to the forest floor, old growth trees provide structural channel stability, and increases fish habitat diversity. This component is now absent in much of the mid-to-low elevations because of a policy that was implemented in the late 1960's. The policy required debris to be removed from stream channels. It came in response to the heavy damage to roads, bridges, culverts, and other structures during the 100 year flood event of 1964. Large wood was blamed for the damage, and techniques to quickly move water through the stream channel were employed to reduce damage from future events. The river systems were left without the stabilizing influence of large wood, and have suffered lateral scour and entrenchment. This has led to elevated summer water temperatures, and channel instability. Unstable channels are characterized by wide, shallow stream courses with riffles and raw banks that are easily eroded during high flow events. Systems in this condition are often in poor aquatic habitat condition.

Most of the Forest's lower elevation streams have elevated water temperatures during the summer. These temperatures cause a below-optimum level of aquatic habitat condition. This has been documented by published (Everest et.al. 1982-1985) and unpublished data for:

- Eagle Creek
- Fish Creek
- Lower Clackamas River
- Hot Springs Fork
- Collawash River
- Still Creek
- Ramsey Creek
- Five-Mile Creek
- Lake Branch Creek
- Jordan Creek
- Tygh Creek
- Badger Creek
- Gate Creek
- Rock Creek

Map III-2 Major Drainages and River Basins

The Fish Creek watershed is the site of an intensive, multi-year investigation of aquatic condition. Current measures of reduced fish habitat condition and channel stability include: a 34 percent loss of low flow pool habitat (Everest et al, 1986); levels of large wood (providing channel structure) reduced by about 90% (Everest et al, 1984); and active channel widening and downcutting over at least 60% of the lower 11 miles of stream. Maximum summer water temperatures at the mouth of the stream currently vary between 68-75°F. This represents an increase of 8-10°F from the estimated temperatures of late 1950's.

Turbidity and specific conductivity are generally within acceptable levels for unpolluted mountain streams. Exceptions occur for turbidity. These are usually short-lived responses that occur from storm and snowmelt runoff events. These events have combined with the effects of resource management activities on some of the Forest's east side streams with resultant siltation of some east side spawning gravels.

Sediment and turbidity are also quite noticeable on some of the Forests streams during the summer months. This is a natural phenomenon that results from glaciers melting on Mt. Hood. The sediment and turbidity from the glaciers is called glacial flour, because it gives streams a milky appearance. This is an annual occurrence in the White River, the Sandy River, and the East and Middle Forks of Hood River.

The trophic level and productivity of the Forest's lakes, ponds, and reservoirs vary significantly (see the figure below). The high elevation lakes, such as Olallie Lake, are ultraoligotrophic (Johnson et al, 1985) bodies of water. This means they have high oxygen content and a low nutrient content. In addition, they have low productivity and primarily support a "put-and-take" fishery. Lakes similar to Trillium fall in the middle of the scale, and are called mesotrophic (Johnson et al, 1985). Eutrophic lakes include some of the small recreation ponds constructed on the east side's Barlow Ranger District. These ponds are generally quite productive and support good warm water fish populations.

Trophic levels.

Watersheds on the Forest are generally in a stable condition. Exceptions exist, particularly for watersheds with larger amounts of unstable ground. These include Fish Creek, Hot Springs Fork of the Clackamas River, Collawash River, East Fork of Hood River, and other smaller watersheds. Landslides with unstable channels are the major problems encountered in these watersheds.

The most widespread watershed problem on the Forest is related to the transportation system. Research has shown that the road network generates eighty to ninety percent of sediment increases that result from management activities (Megahan, 1972; EPA, 1975). A compacted road surface has a very low rate of water infiltration. It also intercepts zones of subsurface flow, and collects water in road ditches before returning it to the forest floor through culverts. The water traveling over the road surface erodes and moves the soil. If the flow does not infiltrate the forest floor before it reaches a stream channel, it deposits the sediment into that stream. On steep ground, roads also increase the potential for landslides by cutting through the soil mantle. This destroys the structural integrity for the upslope area. At the same time the amount of water in some micro basins below the road is artificially increased through the culvert and ditch drainage system; this promotes longer periods of soil saturation.

While some river basins have to absorb more water than what was natural, other micro basins will have less. This will cause a change in the localized subsurface flow network. However, except for mass wasting events which completely alter slope hydrology, the overall effect on downstream groundwater is neglibible.

The location of roads is a major watershed management problem. Most of the major transportation routes to the Forest are located in the relatively flat floodplains along the drainages. Floodplain function is impaired by road construction in these areas, which affects the dynamic equilibrium of the drainage. These areas lose their ability for detention storage and infiltration of excess water and sediment during flood events. Flood water becomes confined to a much narrower area which dramatically increases erosion potential. The depth of water on the floodplain is increased for the same runoff event. When the depth of water is doubled, the average water velocity quadruples, and allows particles 64 times larger to be moved (Hewlett and Nutter, 1969). Much of the previously deposited material will erode, which leads to decreases in water quality, channel stability, and fish habitat. These effects also adversely effect groundwater by reducing recharge of the floodplain and, in extreme cases where the channels down-cut, the hyporheic zone may be decreased or lost through de-watering. These problems are dramatically displayed along the East Fork of the Hood River, where highway 35 encroached onto the floodplain prior to the last flood event.

Damage-Producing Storms

Several physical and biological factors influence the damage that occurs to watersheds. The most important factors in managed forests with bare ground and roads are soil erosion hazards, slope severity, runoff and storm events. The storm event is the factor that is beyond control.

High intensity summer thunderstorms, and rain-on-snow events, are the most likely types storms to cause damage to watersheds. Rain-on-snow has had the most widespread effect, and has the greatest impact on the Forest. Intensive summer thunderstorms can cause severe localized erosion and sedimentation. Unacceptable damage can occur from intensive summer thunderstorms at a ten-year return interval. An unacceptable level of damage can occur when site productivity is lost from gully and rill erosion.

Rain-on-snow events can have effects that are similar to summer thunderstorms. They are usually more widespread, and have a greater effect on stream channel systems and floodplains. Channel erosion, fish habitat degradation, and floodplain damage are common features. Facilities located near channels, or in floodplains are at risk. Loss of structures are common for events with at least a 25 year magnitude. On-site erosion is most common on compacted sites, such as roads and skid trails. The more unstable stream channel systems are susceptible to rather low storm return periods, such as a 5-10 year interval. However, significant widespread damage usually requires a minimum of a 25 year magnitude event.

The flood event of December 1964 was estimated to be a 100 year event, and was the most damaging event in recent history. Discharge rates will vary form the east to the west side, for an event of this magnitude. Rates can range form 245 cubic feet per second per square mile (cfm) in the west, to 40 cfm in the extreme east side low lying areas.

Demand Trends and Supply Levels

The following resources and activities are dependent on water supplies:

- timber production
- forage production for wildlife and livestock
- habitat for fish and waterfowl
- recreation use by boaters, anglers,and swimmers

- road construction and maintenance
- drinking water for people, wildlife, and livestock
- fire control

The water used for domestic supply is one of the largest demands. This water has been valued as high as $24 million annually. The total consumption from Forest lands exceeds 165,000 acre feet per year. An acre foot is one acre of land that is covered with water to a depth of one foot. The Portland metro area accounts for 138,000-158,000 acre feet of the total consumption. The remainder is used by the other 15 municipal supply watersheds on the Forest. The location of these watersheds is displayed in Map III-3.

The water produced on the Forest is also important to nearby farms, ranches, and rural areas for irrigation and domestic uses. Most of the east side streams that leave the Forest are diverted to irrigate adjacent state and private lands. The State lands include the White River Wildlife Management Area. Some of the spring runoff water is trapped and stored in reservoirs for later irrigation use. Rock Creek Reservoir, Clear Lake, and Laurance Lake are the primary reservoirs built specifically to hold irrigation water.

The amount of water produced on the Forest is a factor of elevation, precipitation, geomorphology, and soils. The greatest quantities of surface water produced per unit area come from the Sandy River drainage. The Clackamas has the next largest quantity. The smallest amounts are produced from the Badger/Jordan drainage. The current average annual water yield is about 5,000,000 acre feet.

During the majority of water years, the annual supply of water generally exceeds demand. Exceptions occur on the east side of the Forest, and during drought years. Some surface water users add additional water with deep wells for irrigation and domestic supply, during drought years. The city of Portland maintains wells as a back up water source to the Bull Run Watershed. Numerous single family wells exist in rural areas on both sides of the Forest. A significant amount of the water used from these aquifers is produced on the Forest.

Some of the Forest's east side streams are moderately-to-severely lowered to meet irrigation demand during low flow periods. As an example, the Badger Creek stream flow is diverted to an irrigation ditch well inside the Forest boundary. During years of low water levels, restricted stream flows negatively effect fish populations.

Portland General Electric's Three Lynx power house is the major hydropower development on the Forest. There are few opportunities for additional developments. Many proposals for additional developments have been received, but permission to build them has not been granted. There is insufficient streamflow to sustain other resource needs if natural streamflow is interrupted. Recent Wild and Scenic River legislation also prohibits impoundments (such as dams) on certain rivers. See the Wild and Scenic Rivers section of this chapter for more river information.

Significant Resource Interactions

Water is connected with the production and maintenance of all other biotic resources on the Forest. The presence or absence of water determines the kinds of plant communities that will thrive on a specific site. Changes in annual precipitation can increase or reduce the annual rate of growth in plant species, including commercial timber. The Forest's streams, ponds, lakes, and springs support lush riparian habitats that are important as food sources, wildlife cover, and nesting sites. These benefits are the basic water needs of wildlife species.

In an undisturbed forest ecosystem, streams and rivers tend toward a general state of equilibrium in their interactions with other components of the system (Anderson et al, 1976). This means that the amount of water that is carried, the vegetation supported, the sedimentation rates, and groundwater recharge remain fairly constant over the years. This constancy occurs, despite seasonal fluctuations. Regional hydrologic cycles of precipitation, runoff, and evaporation play an important role in the seasonal fluctuations that affect this equilibrium.

Most of the Forest's annual precipitation occurs from November to March. Peak flows correspond to this time frame on west side streams, while the highest annual flows on the east side correspond with snowmelt runoff in April, May and early June. During this period, the Forest's fast-moving, swollen streams and rivers have much more erosive power. They carry larger quantities of sediment and debris downstream. The rate of downcutting, stream channel and bank erosion increases for a short time. Vegetative cover along streambanks may be uprooted with strong flows. Soils that are susceptible to instability problems, such as slumps and landslides, are also more likely to fail during peak runoff periods when they are saturated with moisture. Ephemeral streams may appear during this time.

These temporary conditions diminish when peak flows subside. Sediment gradually settles out, the rate of erosion decreases, and stream turbidity subsides. Some perennial stream flow may decrease to as little as one tenth the amount of peak flows. Intermittent and ephemeral streams usually disappear until the onset of the next runoff period.

Map III-3 Municipal and Fish Hatchery Water Supplies

Resource management activities combine with natural seasonal fluctuations to cause short or long-term shifts in the equilibrium of Forest streams. As an example, the openings created in forests by timber management activities, such as clearcuts, accumulate more snow than the surrounding forested areas (Anderson and West, 1966). These openings also "use" significantly less water than forested areas, due to a reduction in evapotranspiration. They have higher melt rates of accumulated snow than the surrounding, undisturbed areas (Berris et al, 1986, Christner et al, 1982).

During snowmelt, a clearcut site contributes more runoff to streams than it did in an unharvested condition. The increased runoff can extend the time a stream is at bank full discharge (Fedora et al, 1985), or can increase the size of the peak flow in small headwater streams (Berris et al, 1986, Harr, 1986, Troendle et al, 1986, Anderson et al, 1976). Longer or larger high discharge rates can significantly increase the potential for stream bank erosion. The rate of erosion will vary with the stability of the stream bank.

On a positive note, these forest openings increase the amount of water available to recharge groundwater systms, and will generally increase streamflow during baseflow conditions. Intermittant channels will generally respond by flowing for a longer period of time.

Logging, and other timber management activities, require roads. Compacted road surfaces tend to act as collectors of surface water. As this water moves down an unpaved road, or along a roadside ditch, it accumulates sediment. The water eventually finds its way back into the Forest's stream channels. The sediment-laden water reaches stream drainages much more quickly than if it had soaked through the forest floor before reaching the stream.

On the Forest's east side, riparian areas water sources are attractive to domestic livestock because they provide relatively succulent forage, shade, and water. When livestock concentrate along stream bottom lands, they graze heavily on streamside vegetation and trample streambanks. The root systems of streamside vegetation are important for channel stability. Shrub and tree canopies shade and cool stream waters. Extensive loss of streamside vegetation increases channel erosion, and increases stream sedimentation and turbidity. Water temperatures become elevated during the late summer when shrubs and trees that provided shade are removed from riparian areas. This can increase mortality rates for anadromous and resident fish.

Human visitors are also attracted to the Forest's rivers, streams, meadows, and lakes. Most of the developed campgrounds are located near water. Some recreational activities such as off-road vehicle use can produce erosion, and can increase sediment and turbidity when they occur in or near springs, streams, or lakes.

Fires improve or decrease water quality. The effect of fire is determined by it's intensity, magnitude, and location. Streams generally experience an increase in sediment during major rainfall or snowmelt that follows a wildfire. These effects can continue for a number of years if the watershed is slow to recover. Prescribed fire can benefit water quality by regenerating understory vegetation, providing a better soil cover and reducing the potential for soil erosion into streams. Short-term increases in stream turbidity, sediment, and nutrients are common during the first year after a prescribed fire treatment. These effects occur at a much lower rate than during a major rainfall or snowmelt.

Watersheds having significant "beneficial uses" (including domestic water supply and high fisheries values) or which are internally sensitive to the effects of management activities were inventoried and considered for Special Emphasis Watershed (SEW) designation (Map III-5).

Riparian Areas

Background

Riparian areas (see Glossary) have distinctive resource values and characteristics reflecting the influence of water. They are found adjacent to rivers, streams, lakes, ponds, seeps, and springs. Although they represent only a portion of the total land base, riparian areas are a critical source of diversity for the Forest ecosystem. Resources such as fish, water, wildlife and plants are directly dependent upon them. Riparian areas provide some of the most important wildlife habitats in the forests of Western Oregon and Washington. More habitat niches are provided in riparian areas than in any other type of habitat (USDA Forest Service, 1985). These areas also have major influences on aquatic habitat (such as fish habitat, water quality and quantity). Vegetation stabilizes streambanks, shades the water, filters sediment, and provides a food source for the aquatic system. Large wood and logs stabilize stream channels, control the routing of sediment, and provide complexity to the aquatic habitat by shaping pools, riffles, and gravel bars (Sedell et. al., USDA Forest Service, 1983).

Riparian areas include floodplains and wetlands, and are found in association with the streams, lakes, reservoirs, or other bodies of water which make up aquatic ecosystems. Riparian areas typically include lands and vegetation immediately adjacent to these bodies of water and the transition zone between aquatic and upland ecosystems. (See Glossary, Riparian Ecosystem.)

Riparian areas on the Forest can be associated with running water or standing water. The character of the water that is associated with each area largely determines its general and functional characteristics, as well as its relationships to other resources. The diversity provided by riparian areas is evident in the following catagories:

Group One: Running Water (streams)

- Fish-bearing and perennial streams (Class I, II, and III).
- Intermittent streams (Class IV).

Group Two: Standing Water

- Lakes and reservoirs.
- Wetlands: bogs, wet meadows, marshes, etc. These normally occur on slopes that are less than 30%.
- Seeps/springs. These normally occur on slopes that are more than 30%.

According to a 1982 inventory, riparian areas occupy about 16% of the Forest, or approximately 179,000 acres. This does not include the surface area of flowing or standing water (this information is provided in the Water section of this chapter). This estimate is based on an average riparian width of 100 feet from the side of each perennial stream bank, and 50 feet of width from the side each intermittent stream bank for a corresponding total riparian width of 200 and 100 feet, respectively, for each type of stream. Actual riparian widths are known to vary from these estimates for individual strams. As shown in the accompanying graph, fish-bearing perennial streams, and intermittent streams, occupy approximately two-thirds of the Forest's total riparian area.

The acreage of standing water riparian area (lakes, reservoirs, seeps, and springs) was calculated from field mapping (K.M. Geyer, 1982). Differentiation between wetlands and seep/spring areas for planning purposes was accomplished through a slope break. Those wet areas occurring on slopes greater than 30 percent were classified as seeps/springs, while those on slopes less than 30 percent were considered wetlands.

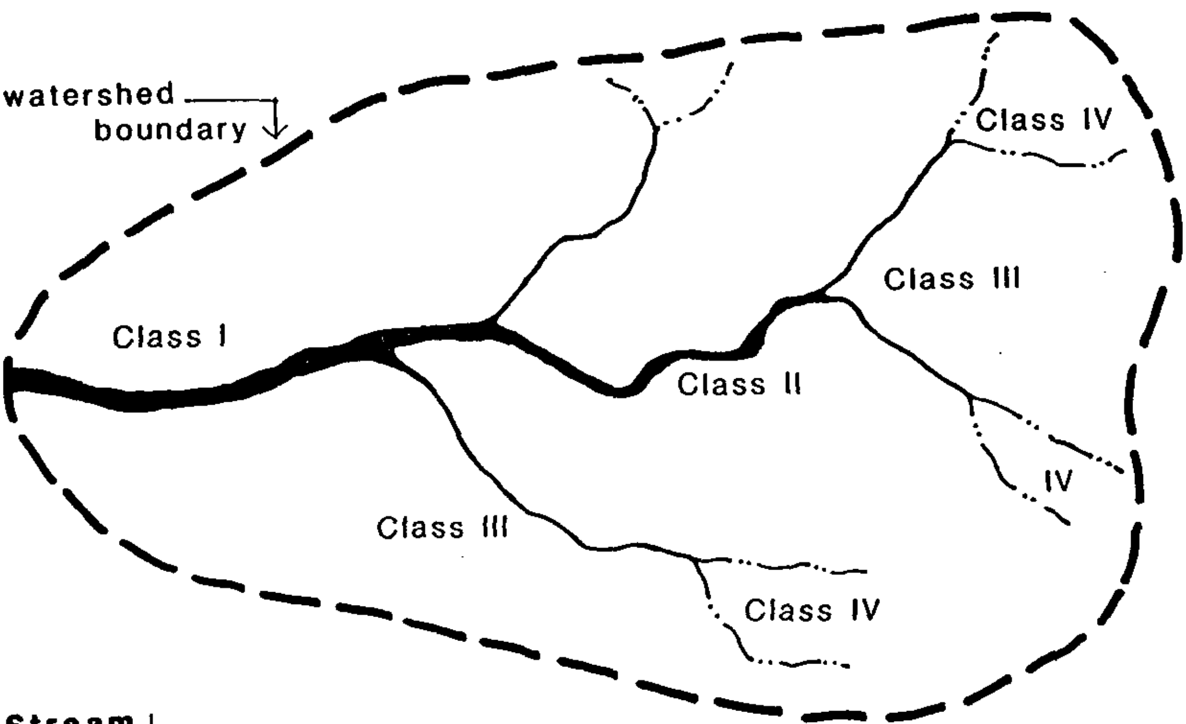
Relationships to the Natural Environment

As stated above, the Forest's riparian area and ecosystems support a wide variety of natural resources, including water, fish, wildlife, vegetation, and sensitive species of plants and animals. These resources would drastically change or perish if substantial changes were made to the ecosystem. 208 of the approximate 265 species of wildlife on the Forest, use riparian areas regularly. Forty species depend on them directly. All 48 species of fish on the Forest rely on riparian areas to maintain livable water quality. Twenty species of sensitive plants continue to survive because of these areas. Riparian areas and associated ecosystems are responsible for much of the Forest's biological diversity, and are the most productive and diverse component of forest and range ecosystem. The character of surface water controls the type and extent of aquatic habitat and influences the type and diversity of riparian vegetation which occurs, (USDA Forest Service, 1985). For example, vegetation that grows in continuously saturated conditions will have a mix of species that is different than those that grow in an area with seasonally saturated conditions.

Riparian area.

Riparian areas are an important integral component of the Forest's natural environment. These areas are important areas of ground water recharge for local and regional aquifers. They detain sub-surface and surface water during high flow events, and moderate peak and low water flow conditions. This frequently provides high quality water for plants and animals throughout the year. Detention storage in healthy riparian areas will reduce damage from violent flood events.

Map III-4 Typical Stream Classification



Stream Class	Qualifying Criteria
I	municipal/ domestic supply, large volume, anadromous fishery
II	resident trout fishery, significant volume to affect Class I
III	perennial stream, no fish present
IV	intermittent flow

Map III-5 Candidate Special Emphasis Watersheds

Riparian areas strongly influence the quality of fish habitat. Vegetation, including large trees, directly contributes to the food base of aquatic ecosystems, and provides the structures that shape intricate networks of pools, riffles, and quiet backwater side channels. Riparian areas also control or influence the following:water temperature; sediment introduction and routing from channel banks; hiding cover for trout, steelhead and salmon; food inputs of terrestrial and aquatic insects (Mechan et al, USDA Forest Service, 1977). Map III-2 summarizes the relationships of riparian areas to aquatic ecosystems.

Relationship to the Human Environment

Of all of the Forest's resources, few would rank higher in importance to human beings than its riparian-dependent resources. The production of high quality drinking water depends on a vigorous, healthy riparian ecosystem. Fisheries are dependent on the high quality water and habitat that riparian areas provide. Both of these dependent resources are important to the human environment. Water is important for domestic/municipal use and recreation; fish are important as an economic commodity and a recreational pursuit (see the Fish and Water sections for additional information about these resources). Riparian areas also play a key role in maintaining other resources that benefit to the human community, such as timber, forage, recreation, and visual areas. The following quotation sums up key relationships between riparian resources and people:

"Riparian zones are important for many other types of land use. Highly productive timber sites frequently occur along streams and around wetlands or lakes. Livestock utilize vegetation in riparian zones more heavily than in other areas because they concentrate there for water, shade, and succulent forage. Riparian zones are used for road locations, particularly in mountainous, rugged terrain. Rock and gravel for building roads have been taken from streambeds and their banks as well as from floodplains. Mining has direct and indirect impacts on riparian areas. Recreationists concentrate their use in wetland and riparian areas where scenic values are high. Riparian zones are preferred for recreational developments such as campgrounds and summer home sites. Because of these conflicting uses, riparian zones are recognized as critical areas in multiple use planning (Brown, 1985)."

Management Concerns

The primary focus of current management is on riparian areas that are along streams. The other types of riparian areas are generally recognized as special wildlife habitats or as recreational areas (such as those sited around lakes and rivers). The enhancement and maintenance of water quality is a main concern in the current planning for streamside management areas. Management concerns are specifically directed at maintaining or improving water temperature, and at keeping sediment and turbidity at pre-activity levels. Approximately 5,000 acres of streamside riparian areas are classified as "full protection leave areas", which means that timber harvest is not allowed. This is due to the high risk of sedimentation (Timber Management Plan, USDA Forest Service, Mt. Hood NF, 1980). In these areas, and in all remaining areas, Best Management Practices (BMPs) are employed as required by the Clean Water Act of 1977, amended 1987. The BMPs are implemented on a case-by-case basis, to ensure that goals and objectives for riparian dependent resources (primarily for water) are met.

These concerns gained additional emphasis in about 1980, when a wider management concept was recognized. This concept identified a wider range of riparian area types and related values, and emphasized ecosystem management for riparian-dependent resources. Since 1982, an increased level of knowledge has highlighted the need for more sophisticated management that recognizes all dependent resources. The previous management emphasized the removal of wood from riparian and channel areas, in the belief that this would prevent damage to channels, riparian areas, and developed structures during flood events. This practice has led to declining riparian conditions that have adversely affected water quality, channel morphology, and fish and wildlife habitat. These conditions have been substantiated by Forestwide, site specific studies. The trends are generally most prominent in watersheds that have had long term or large scale disturbance. Disturbances predominantly occur from road building, timber harvest, and dispersed and developed recreation. Forestwide trends in aquatic condition are strongly influenced by riparian area conditions. These trends, and their influential factors, are discussed in detail in the Water and Fish sections of this chapter.

Forest Diversity

Background

Forest diversity is "the distribution and abundance of different plant and animal communities and species . . ." (36 CFR 219.3). There are two basic kinds of diversity, compositional and structural. Compositional diversity refers to the mix of different plant or animal species or

Table III-3 Forest Acres by Size Class and Vegetation Types

Vegetation Zone	Size Class									
	21"+	8-21"	Multi[1] Story	<8", >20'	<8", >20'	4.5'-20'	< 4.5'	Not[2] Stocked	Non-forested[3]	Total
Grand fir/ Ponderosa pine Zone	7,224	96,946	1,808	11,536	20,608	5,562	7,874	2,614		154,172
Mountain hemlock Zone	14,342	69,822	1,220	1,810	20,004	2,062	1,496	522		111,278
Silver fir Zone	102,144	207,016	20,096	22,892	35,254	23,764	21,836	4,512		437,514
Western hemlock Zone	53,306	153,260	17,266	19,438	23,236	13,484	15,416	504		295,910
Total	177,016	527,044	40,390	55,676	99,102	44,872	46,622	8,152	52,852	1,051,726

[1] *The multi-story class does not typically have a size range, but is usually 21"+.*

[2] *Not stocked with common species, but classified as forest.*

[3] *< 10 percent crown closure.*

types within an area. Structural diversity applies mainly to vegetation, and refers to different physical characteristics (such as age or size classes, living vs. dead components, life forms, etc.).

There are several different ways which diversity can be discussed. The most specific is genetic diversity, which is the variety of genetic strains within a population of individuals of the same species. Another way is species diversity (the mix of species within a community). Community diversity is the patchwork of different plant or animal communities. Landscape diversity is the patterns that are seen on a large scale, such as a drainage basin. Since the Forest Plan deals with broad land allocations, landscape-level diversity is probably the most appropriate scale for consideration. This section will emphasize issues and concepts related to landscapes. The size, structure, composition, distribution and interconnectedness of patches of unique and typical vegetation will be stressed. Their relationships with wildlife habitat and populations will also be examined.

Existing Conditions

Forest diversity is reflected in the composition, structure and geographic distribution of plant and animal communities within the Mt. Hood National Forest. One way of getting a general picture of the diversity within the National Forest is to look at the numbers of broad vegetative types (in terms of dominant species and stand structural class), and their relative abundance on the landscape. Table III-3 displays this information for generalized forest and non-forest vegetation types within the Mt. Hood National Forest. A more detailed description of these vegetation types is found in the "Vegetation" section of this chapter. This amount of diversity is somewhat similar to the diversity found throughout the Cascades between central Oregon and central Washington.

Influences on Current Diversity

Numerous factors have created the diversity we see today, and will continue to affect diversity as the appearance of the Forest changes under management. These factors are discussed in the paragraphs below. Further details about individual factors may be found in other sections of the this chapter.

Climate. Of all the elements that contribute to biological diversity on the Forest, climate is probably the most compelling and unchangeable through forest management . However, even the most conservative predictions about global warming may prove that our assumption about climatic stability are wrong.

The basic climatic themes that affect diversity within the Forest are:

- increasing precipitation with elevation

- decreasing temperature with elevation
- rainshadow/topographic affects

The "Climate" section of this Chapter discusses how moisture from eastward-moving storm systems is "squeezed" out of the clouds by the north-south tending mountain ranges, resulting in a much higher level of precipitation on the west side of the Cascade crest than the east side. These precipitation differences profoundly affect the diversity in species composition between east and west side forests.

The west side is dominated at lower and middle elevations by lush forests of Douglas-fir, western hemlock and western redcedar, with adequate moisture for plant growth throughout the growing season (see Vegetation section for detailed descriptions of vegetative types and distribution). Corresponding elevations on the east side are dominated by more arid forests of Ponderosa pine, Douglas-fir and grand fir, with a much more severe summer drought. Upper elevations on both sides of the crest have vegetation that is much more similar, because the deep snowpack and short growing season become the overriding determinants of vegetative composition. In these areas forests of Pacific silver fir, mountain hemlock, subalpine fir, Engelmann spruce and a variety of other conifers prevail. The climate becomes so severe at the highest elevations that most trees cannot survive. In these areas, alpine and subalpine vegetation (meadows, meadow-forest mosaic and sparsely vegetated rocky areas) can be found.

In additions to this generalized pattern, local climatic variations greatly affect the diversity of the forest. As an example, localized rainshadow effects produce major shifts in the species composition of understories within mature stands, and in early successional stages. Another example is the extremely abrupt decline in precipitation that begins east of the Cascade crest. It produces significant changes in vegetation in a very short distance. This change is contrasted with the west side, where zonal shifts occur gradually over a large area. On a smaller scale, simple changes in aspect (such as from north-to south-facing slopes) often result in marked vegetation differences.

Local climate affects structural as well as compositional diversity. For example, valley bottoms with a cool, wet climate are often the site of the late successional stage we refer to as old growth, because the climate is not conducive to the historic stand-destroying fires common to much of the Forest. Aspect (the direction a slope faces) also has a dramatic affect on diversity and productivity, because of the significant variation in solar input and evapotranspiration between different aspects.

Bedrock geology, geologic events, soil formation processes. As with climate, geology and soils factors are relatively constant, although human activities have the potential to significantly affect soil characteristics that foster productivity. The main geologic processes that have contributed to the current forest diversity are landflows, floods, volcanic activity and glaciation. These processes have produced a variety of soil parent materials (such as bedrock) which lead to soil formation. These processes are heavily influenced by climate.

There are three generalized patterns of soil formation:

- Relatively deep, fertile soils derived from volcanic materials at lower to mid-elevations on the west side.
- Moderately fertile soils developed in loess, volcanic ash or glacial till on the east side.
- Thin, less fertile, younger soils at upper elevations, derived from glaciated volcanic material.

The resulting soils primarily support the forested and alpine vegetation types described above. However, local soil and geologic variations produce many interesting and unique plant communities that make a significant contribution to the structural and compositional diversity of the forest. Some examples are:

- Rock outcroppings that support communities dominated by grasses, forbs, and sometimes Oregon white oak.
- Recent landslides vegetated by shrubs, forbs and small trees.
- Areas of perched water table that support wetland vegetation (bogs, marshes and swamps).
- Talus or rubble slopes with sparse forbs and shrubs.
- Riparian (stream or lakeside) areas with a wide variety of vegetation types, which often have a component of hardwoods.

The Columbia River Gorge is a geologic phenomenon that is extremely important to the diversity of the Mt. Hood National Forest. It has a rich variety of habitats and climatic conditions, and entails eastside and westside plant populations.For these reasons, the Gorge has a plant species richness that exceeds any other river canyon in the Pacific Northwest (K.L. Chambers in Jolley 1988). In addition, there are a number of plants that are endemic (found nowhere else) to the Gorge.

Fire. Fire has been an important determinant of the distribution of vegetation types on the landscape. This is because of its historic presence, as well as due to current fire management practices.

Historically, fire played an important role in the dynamics of our forest stands. On the west side of the Cascades a series of extensive conflagration fires produced the mosaic of stand ages we see today. The most recent occurred at the return of the century. The fire return frequency was highly variable, but it appears to have been decades or centuries in length. Fires at higher elevations would have had a much longer return frequency than fires at lower elevations. Ther is also evidence that ground fires were less severe and more localized. Less is known about their frequency. On the east side of the crest, historic ground fires were very common, and had a return frequency of a few years or decades. Conflagration fires also occurred.

Fires still occur, but in a much different context. Accidental fires that occur in today's management regime are generally small in comparison to historic fires. The resulting environment is different as well. Before forest management, large patches of snags and down logs were left after crown fires. Today, burned stands are usually salvage logged, and the outcome is similar to a clearcut.

Fire is also used purposely to create desired conditions for fuels, reforestation, silviculture and wildlife habitat. In some cases, such as prescribed underburning in eastside Douglas-fir, Ponderosa pine and grand fir forests, the conditions that are produced are probably very similar to those that followed the natural ground fires in historic times. In other cases, such as burned logging debris in clearcuts, the results are very different from historic natural fires. These fires produced a large amount of down wood that lasted well into the establishment of the new forest, and contributed to the productivity of the subsequent forest stand.

All of these factors contribute significantly to the current and future diversity of the forest. They contribute at the landscape scale, as well as at the single stand scale. Some examples are described below.

The intensity of a fire has a significant effect on the species composition of the successional stages that follow it. This is partly due to fire's selective role. Fire can destroy or stimulate the reproductive parts of species. In addition to fire's selective role, changes in soil are also a factor. This change could include the loss of nutrient-supplying organic matter. Structural diversity is also affected through the presence or ab-

Fire succession series. →

sence of standing or down dead material. This affects such diverse things as the length of time it takes for coniferous vegetation to re-occupy the site, nutrient cycling, long-term productivity and wildlife habitat.

On the east side, exclusion of frequent ground fires is resulting in a major shift in forest species composition. Ponderosa pine, and to a lesser extent Douglas-fir, are species that are relatively fire-resistant. They are being replaced by grand fir, which is a species that is less fire-resistant, but can reproduce itself more successfully in a closed canopy stand.

The general exclusion of fire, along with post-fire salvage, has significantly reduced the numbers of snags and down logs from historic levels. This has major implications for wildlife species that use snag and down log habitat. Snags, standing green trees and down logs are left in harvested areas in an attempt to compensate for this loss. They tend to be smaller in size, fewer in number, and distributed differently than under natural fire conditions. In addition, the exclusion of ground fires has dramatically reduced the natural thinning phenomenon in stands. This results in denser stands of smaller trees. Prescribed underburning and thinning are management strategies used to create the same result as natural ground fires.

The distribution of old growth is an important component of forest diversity, and is a direct result of fire history. However, it has also been extensively modified by timber harvest. In general, the remaining old growth occupies cool, moist environments that are relatively more resistant to fire than other sites, and have escaped the repeated conflagrations for centuries. Stands of existing old growth are smaller and more isolated than in historic times.

Insects and Diseases. Various insects and diseases affect the compositional and structural diversity of the forest by selectively choosing certain plant hosts.

Spruce budworm

The spruce budworm is a recent example. It has defoliated Douglas-fir, grand fir and Pacific silver fir on approximately 428,000 acres in the last 3 to 5 years. This acreage figure includes a portion of the Warm Springs Indian Reservation, which was also affected by the outbreak. The defoliation has occurred mainly on the east side and near the Cascade crest on the west side of the Forest. On the east side, defoliation appears to be leading to a decrease in the portion of grand fir that also occur in stands that also contain Douglas-fir and Ponderosa pine.

Various types of root rots are also important pathogenic contributors to forest diversity at the present time. They primarily effect Douglas-fir and true firs, and cause premature mortality. Root rot mortality occurs mainly as localized "pockets" within the conifer forest matrix. On the west side of the Cascade crest, these pockets become occupied by hardwood species. On the east side they often remain in a more "open" condition, and contain several species of shrubs and herbaceous species.

When an area that is infected with root rot is harvested, the rot organisms stay viable in the old roots, and infect the new generation of conifers. Root rot pockets in plantations are often replanted with resistant conifer species, which are usually different from those planted in non-infected sites. Although it appears that root rots actually result in increased compositional and structural diversity, the proportion of susceptible species actually declines when large areas are harvested.

White pine blister rust is not as common today as it was historically. However, it is another pathogen that has significantly affected the species composition of upper elevation stands. In the early decades of this century blister rust extensively infected western white pine in the Pacific Northwest. A widespread program of salvage harvest was instituted to "sanitize" the affected stands, and to bring the outbreak to an end. As a result, the current distribution of western white pine is much reduced, and the seed source in some areas is virtually eliminated. Efforts are currently underway to produce rust-resistant strains of western white pine which can be introduced into plantations in suitable sites.

Timber Management. When compared to the other factors, *timber management has been affecting forest diversity* for a very short time. Its influence can be measured in decades, rather than centuries. Despite this brief time span, it has made a significant contribution to the structural, compositional and geographical diversity that occurs in both in plant and animal populations. Some of this diversity represent a major departure from the period before timber management.

Some of the ways in which timber management has affected forest diversity are listed below.

On a landscape level, clearcutting has made the most obvious changes in forest diversity, when compared to historic times. In the past, the forest consisted of large tracts of relatively even-aged stands. It is likely that only a few age classes were represented in a single drainage. In the staggered setting pattern of clearcutting, a single drainage may now have a number of much smaller patches, which represent a variety of ages and successional stages. This means a particular area may have a much larger variety of different vegetative types. There will be more edge habitat (which favors certain species of wildlife), and there will be much less interior-forest habitat (which favors other species). The process of creating many patches of various ages is called habitat fragmentation. An area is not considered to be fragmented simply because it has been harvested. Fragmentation refers to the "patchiness" of the vegetation. In some areas, depending on the pattern of storm-force winds, fragmentation appears to increase the susceptibility of stands to windthrow. The Clackamas, Bull Run and Hood River drainages contain the highest levels of fragmentation on the Forest, although all of these areas also contain significant acreages of nonfragmented forest. As expected, the Wilderness areas contain the most extensive tracts of unfragmented landscape.

Historical timber harvest has occurred primarily in old growth stands because of the great economical value of old growth stands. The easily-accessible, low elevation stands provide the greatest supply. This has led to a substantial decrease in the proportion of the old growth successional stage in harvested areas, as well as a decrease in the average size of intact stands.

In the process of artificial reforestation, decisions are made which have an effect on the genetic and species-level diversity of future forests. Reforestation involves the selection and culture of genetic strains of certain species that are anticipated to perform best when outplanted in clearcuts. Over the long term, it would be expected that this might alter the genetic heritage and production rates of future forest stands. In fact, it is predicted this process will actually yield greater volumes than purely natural reforestation would. In actual practice, genetic and species diversity in these managed stands is augmented by natural seeding-in from adjacent unmanaged stands. At this time, it is unknown whether the long term effects of this process actually increases or decreases genetic diversity from natural levels.

Timber harvest by clearcutting always results in a temporary shift away from conifer forest, to successional stages that are occupied by herbaceous plants and shrubs. In most cases, management is oriented to minimize the length of time a site is occupied by these early successional stages, and to reestablish conifers as quickly as possible. This is partly due to the tendency of sites to become "brushy" and difficult to reforest. In some vegetation types, this is probably a significant departure from historical successional processes. As an example, long-lived snowbrush ceanothus or red alder stages would naturally occur in these sites.

Livestock Grazing. At the present time, grazing probably exerts a minor impact on upland forest diversity. This is because it occurs in a relatively limited area and is basically transitory in nature (grazing in the early successional stages of clearcuts for a few years while conifers are becoming established). In riparian sites, there is still concern that grazing by livestock adversely affects structural and species diversity.

In the past (such as between 1900 and 1940), grazing was a much more significant contributor to changes in the composition and structure of vegetation. In some cases, the effects have carried forward into the present day. Two examples are described below.

At low elevations on the east side, overgrazing by sheep and cattle resulted in a shift in grassland production. Native bunchgrasses became dominated by cheatgrass in many of the natural grassland sites.

Many of the alpine areas of Mt. Hood were historically used as sheep summer range. In many places, this resulted in a shift from graminoid-dominated communities to forb meadows. Several decades have passed since grazing was discontinued. Successional processes have resulted in changing species composition

Livestock overgrazing may lead to soil erosion problems.

Past Extinctions and Introductions

Several species are known to have been eliminated from the Washington Cascades due to human activities. These are large, mobile predators with large home-range requirements. Other species of plants and animals are sensitive, which means that they have populations which could become threatened with extinction. Generally, these species are characteristic of habitats which are inherently rare, such as a particular wetland characteristics. Species of great management concern include the owl and pine marten, which require old growth and mature forest stands for the maintenance of viable populations. Management for continued viability of animal populations is implemented by assessing habitat needs and occurrences of major indicator species. The wildlife section of this chapter discusses the rationale behind the selection of our management indicator species. The vegetation section of this chapter discusses management to protect sensitive, threatened or endangered plant species.

Major effects to plant populations result from timber harvest that replaces mature and old stands, and their characteristic populations . These older stands are replaced with open habitats where colonizing, sun-loving species dominate until an overstory canopy is established. Low impact harvest practices are possible where substantial portions of the pre-harvest plant populations survive and rapidly re-establish stands that are fairly similar to the previous understory. Many special management activities also impact plant populations. In the past, the use of herbicides had great effects on plant communities in some young plantations. Other impacts include the use of prescribed fire to alter plant abundance and composition, livestock grazing and other vegetation management techniques.

Silvicultural decisions regarding tree planting and thinning have great effects on the long-term diversity of trees on the Forest. The Forest uses site-appropriate planting prescriptions with native species. A difference in the species composition of planted stock and natural stands indicates a potential change in the diversity of the future managed stands. To date, natural seedling establishment continues to be a very important component of plantations throughout the Forest, This is particularly true in the colder and more difficult reforestation sites. Selective management of plantations by thinning has a great effect on species composition and potentially diversity when a particular species are favored or eradicated.

Future impacts on species diversity may be caused by competition from non-native invading species. A number of noxious weeds, such as tansy ragweed, Himalayan blackberry, and Scotch broom, are able to outcompete native species in some locales. Displacement is most likely in very disturbed sites, such as clearcuts. In the future, it is possible that other alien species, such as English ivy or holly, may become established. These species tend to form near monocultures. Their establishment results in the displacement of native plants, as well as the animal and insect species that are dependent on them. As the surrounding land ownerships become more and more developed, it will be more and more difficult for National Forest lands to maintain all of the characteristics of natural forests unless these invading noxious species are carefully managed.

Himalaya Blackberry

The surrounding ownerships have greatly changed stand structure in comparison with pre-settlement times. For this reason, the impacts of these changes need to be assessed, in relationship to the Forest's ability to sustain the species characteristics of our prior, natural conditions.

Relationship to the Natural Environment

Diversity is an intrinsic feature of the natural environment. The degree to which species and ecosystems are allowed to carry out their functions unimpaired largely determines the extent to which natural environments remain in equilibrium and able to produce the commodities and amenities that we as humans value. Permanent loss of a species or structural element from a system often results in a need for artificial and expensive energy supplements (such as fertilizers) to perpetuate the system function. Loss of a species is a social and scientific concern in its own right. Maintenance of diversity generally reduces the probability of extinctions.

The link between the stability of natural environments and diversity is a basic biological principle. A commonly-cited example is in the agricultural use of monocultures (single-species communities), in which the entire system may be destroyed by an agent which attacks the single species. The least diverse forest is vastly more diverse than a corn field. However, the principle is still the same. In order to protect the stability of the natural landscape, we perceive a need to have representation of all native species and ecosystem types within the Forest. Unique, as well as common landscapes should be represented.

Long term forest productivity is a related concept. Diversity protects ecosystem resilience (the ability to absorb change without loss of function or productivity) by insuring the presence of ecosystem elements that function together to produce outputs that we may use, harvest or enjoy.

Relationship to the Human Environment

Several aspects of forest diversity are of paramount public interest. The amount and distribution of old growth is one of the most hotly debated issues. Topics include the interest in old growth for recreation and aesthetic qualities, as a rich source of high quality timber, as a provider of species habitat, and as a unique entity unto itself. Much of the disagreement centers around how much old growth should be preserved. Issues related to this are fragmentation (how to preserve old growth in such a way that it can continue to function as interior habitat), and maintenance of suitable corridors between patches of old growth. It is worth noting that old growth is not synonymous with habitat for particular wildlife species (such as the spotted owl, pine marten, or woodpecker). It is a long-lived stage in the succession of forest vegetation that has certain ecological characteristics that set it apart from younger forests.

Preservation of threatened, endangered and sensitive plant and animal species, as well as unique or unusual plant communities, is another important aspect of diversity that has received much attention. This attention has come from the public, government agencies, and private organizations.

The Columbia River Gorge, as the Pacific Northwest's "crown jewel" of botanical and habitat diversity, has also received wide public attention for long time. The Gorge has long been appreciated for it's unique contributions to Forest diversity. This recognition is due to the Gorge's species richness, and the relatively high numbers of endemic plants.

Management Concerns

Current forest management trends are addressing concerns that relate directly to diversity. One of these is habitat or landscape fragmentation. This is the tendency of landscapes to become a mosaic of small patches, particularly under the staggered setting system of clearcutting. Fragmentation is of concern because it dramatically reduces the ability of the remaining undisturbed patches to function as interior habitat. It also creates a disproportionate amount of edge and open habitat. This is a concern in areas where the objective is to provide adequate habitat for interior-forest species or for those species that are adversely affected by edge or open habitats. A related concern is the preservation of corridors between areas of similar habitat. Corridors are important for animals that occupy scarce or scattered habitats, and for helping to provide an interchange of breeding individuals and genetic material. In some areas, fragmentation also is thought to increase the likelihood of windthrow.

Ecosystem simplification is another concern. In some cases, past management practices have favored retention of certain ecosystem elements (such as the vigorously growing trees of desired species) at the expense of other elements (snags, down logs, undesirable shrub and tree species). It is now becoming apparent that all of the elements of the system play a role in perpetuating productivity. Some of them are essential. More attention is now given to ensuring the availability of snags and down logs in managed forests. In some cases, formerly undesirable species (such as red alder and snowbrush ceanothus) are becoming appreciated for their ability to enhance site nutrients, and are no longer eradicated. An increasingly important objective of forest management has been the consideration of all of the functional elements, and not simply a focus on those of economic interest.

Vegetative Zones and Their Plant Communities

Background

Soil types, moisture, climate, and elevation determine the species, locations, and growing habits of the Forest's plant life. Various combinations of geology and growing conditions have created the six different vegetative zones described below, as well as a unique botanical area: the Columbia River Gorge corridor. The Gorge belongs to neither the west or east side of the forest. Plant regrowth and recovery (a process called succession) begins after a timber harvest, or after a natural disturbance. The vegetation zone, and the severity of the disturbance, determines the kind of succession that occurs.

Vegetation Zone Overview

West Side Forests: the Western Hemlock Zone. The growing conditions in this zone are determined by its low elevation and wet, mild climate. This zone extends upward to about 3,000 feet. Its average low temperatures range from the mid 20's to the low 30's (Fahrenheit), and high temperatures range up to eighty degrees in July. Its climate is tempered by the moist, west winds from the Pacific Ocean, which deliver from 60 to 120 inches of precipitation per year. The zone's higher elevations have its coolest and wettest conditions.

Western hemlock is the predominant tree in sites that have been left undisturbed for hundreds of years. However, undisturbed sites are infrequent in this zone because of windstorms, fires, earth slides, volcanic activity, and logging. The fast-growing Douglas fir is the most abundant tree in the zone. It is also the most valuable commercial species on the Forest. A mature Douglas fir stand may be dense without much vegetation underneath. A different stand of the same species may be associated with shrubs and western hemlock may be found growing underneath. Western red cedar is a frequent occupant of wet sites in this zone.

Plant community composition varies primarily by the moisture and temperature patterns of the individual sites. These communities have been described in detail, and serve as environmental indicators to aid forest management (see the plant association guide written by Halverson et al., 1986). The wet and moist communities are dominated by ferns and a lush flora of many small herbs. Moderate, well-drained sites are dominated by shrubs, including dwarf Oregon grape, vine maple, red huckleberry, and rhododendron. Dry communities are most abundant on rocky sites, and support oceanspray and salal communities.

Plant communities reestablish themselves fairly quickly after a disturbance occurs. The rate of recovery depends on the number of surviving plants that grow from the surviving parts of pre-existing plants. The sudden addition of abundant sunlight and bare ground allows immediate, rapid growth of herbs that have well-dispersed, wind-blown seeds. These herbs include fireweed and groundsol. Within 5 years of overstory removal, shrubs usually form a canopy layer among the new growth of conifers. Moist sites may feature red alder, and well-drained sites which burned in a hot fire will usually become dominated by snowbrush ceanothus. Within 10 to 20 years, conifer canopies will close. These canopies are usually Douglas-fir dominated. They will begin to shade-out many of the herbs and shrubs that require abundant sunlight. Stands which have dense tree canopies often have dark understories, and will not support much of their characteristic vegetative diversity until small openings appear in the mature forest. Shade tolerant conifers, such as western hemlock and western redcedar, will also begin to become abundant at that time.

High Elevation Forests: The Pacific Silver Fir Zone. The growing conditions in this zone are determined by its 3,000 to 5,000 feet elevation, cool to cold climate, and high precipitation. Much of the precipitation falls as snow.

The zone supports a variety of conifers, and includes silver fir, western hemlock, Douglas fir, noble fir, and western white pine. Silver fir can withstand snow damage, and will dominate a site that is left undisturbed for 750 years or more. A stand of trees about 400 to 500 years old may consist of large, scattered Douglas firs, and numerous silver fir and western hemlock.

Plant community composition in this zone is greatly affected by the amount of moisture at the site, as in the western hemlock zone. However, the severity of winter and the duration of snow-packs are also critical environmental features which structure the species composition and abundance. The details of plant communities in this zone are described in Hemstrom et al. 1982. Cold, moist communities are dominated by Cascades azalea and fool's huckleberry. The cold, dry sites are often on rocky, shallow soils, and are dominated by big huckleberry and beargrass. The low elevation, warmer portion of the zone is dominated by lush herb displays at moist sites. These areas include ferns, Oregon oxalis, foamflower, and devil's club. The drier, warm plant communities feature an abundance of rhododendron, which occur with beargrass, dwarf Oregon grape or salal. Moderate sites in this zone feature herb-rich communities that are found with big huckleberry and Alaska huckleberry. The high meadows and avalanche chutes feature diverse communities of grasses, sedges, shrubs and showy flowering herbs.

Plant succession, in the silver fir zone follows a pattern that is similar to the western hemlock zone. This is particularly true in the lower elevations. There are two major differences: the conifer canopies reestablish more slowly, and there are species shifts. The higher elevation portions of this zone do not go through the dense, dark pole stages that lack understories. These sites maintain characteristic understory species, such as big huckleberry and beargrass, throughout their successional development. Douglas-fir, noble fir and western white pine play important roles as an early tree species in natural and artificially regenerated stands. Pacific silver fir dominates the shade-tolerant tree layer of mature and older stands. The species composition in recently disturbed sites with full sunlight is very similar to the lower elevation zone. However, the understories develop into distinctive communities as the conifer layer dominates.

High Elevation Forests: The Mountain Hemlock Zone. The growing conditions in this zone reflect its elevation (4500 feet to timberline), cold climate, and high precipitation. It is the highest forested zone, extends in a band around Mt. Hood, and continues south along the Cascade crest to Mt. Jefferson. Its snow cover lasts six to eight months of the year. Most of the precipitation above 64 inches falls as snow that accumulates in a snowpack as deep as 25 feet.

The differences in plant life in this zone, have led to its division into lower and upper subzones. The major species of conifers in the lower subzone closed forest are mountain hemlock, silver fir, subalpine fir, and lodgepole pine. Noble fir, Alaska cedar, Engelmann spruce, western white pine, and Douglas fir may be found in lesser quantities. Mountain hemlock is most abundant on the west side; subalpine fir is most abundant on the east side. Mountain hemlock, silver fir, and big huckleberry often associate together. The details of plant communities in this portion of the zone have been described by Hemstrom et al. 1982. Alaska cedar and Cascade azalea grow in wet sites. Beargrass is a common dominant species of the mountain hemlock zone understories. The lower zone has a few permanent meadows with huckleberries, beargrass, mountain ash, and spirea. Subalpine fir is the most widespread conifer in the upper subzone, and is followed by mountain hemlock and whitebark pine. Meadows mix with forested areas throughout this zone. The forests vary in size from patches of trees to trees standing alone. These meadows feature many showy herbs which attract wildflower lovers, as well as numerous grass, sedge and willow species. At timberline and below, trees in this zone stand erect. Trees in many sites closer to the alpine zone become more like shrubs, and often appear to grow horizontally to form tangled mats of brush. This brush is called "krummholz," which is a German word meaning "crooked wood."

Vegetation regrowth in both subzones occurs very slowly because of the cold environment. The slow development of the stands is even evident in closed mountain hemlock forests, where there is usually a large difference in the ages of individual trees. Wildfire sites may support dense fireweed for several years and then will slowly develop into brushfields. These brushfields often contain highly desirable big huckleberries. Tree reestablishment generally occurs in a patchy manner. Tree regrowth at these harsh sites near treeline may be determined as much by geological events, as by the biological ability of the trees to survive.

Above Tree-line: The Alpine Zone. Growing conditions in this zone are rugged. The zone occurs above timberline, and lies just below the mountain's permanent snow and ice. The wind, snow, and cold are extreme. Much of the zone is made on steep slopes with glaciers, bare rocks, and rubble.

Growth in this zone consists of meadowlands, which vary according to the characteristics of the sites. On moist slopes and ridges free from snow three to four months of the year, heather and huckleberry dominate. On well-watered slopes, meadows are lush with showy wildflowers like lupine, paintbrushes, fawn lilies, and pasque flowers. Along alpine streams, monkey flowers and coltsfoot do well. Black sedge grows in cold, wet areas that are free of snow for less than three months of the year. Warmer, drier parts of the zone support grassy meadows. These often contain fescues, with cinquefoil, lupine, or asters. The very tough sites, such as pumice slopes, gravelly areas, unstable areas, and bare rock can grow pioneer plants like saxifrages, phlox, and knotweed. The plants play important roles in improving these sites by enhancing soil organic matter and by creating protected microsites where shrubs, and later trees, may take root.

East Side Forest: Grand Fir Zone. The growing conditions in this zone reflect its 2,500 to 4,200 feet elevation, as well as it's moderate temperatures and precipitation. The average January temperature is about 23 degrees F.; the average July maximum is about 80 degrees F. The annual precipitation ranges from 30 to 80 inches per year, and averages about 50 inches. There are only about two inches of rainfall during the Summer. Snowfall averages about eight feet per year. The extensive summer drought is the major environmental influence that causes this zone to have a very different flora than westside forests.

This zone's most common tree is grand fir. Additional species include ponderosa pine, lodgepole pine, western larch, and Douglas fir. Any single species of these conifers may dominate a particular stand. Conifers like Engelmann spruce, subalpine fir, mountain hemlock, and western white pine grow in small areas, or in low numbers. Incense cedar is abundant in a small area, and is near the northern limit of its entire range.

Plant community composition is primarily influenced by precipitation and duration of snow-packs (see Topik et al. 1988 for details). The moist, cold sites are dominated by lush herb displays and may include Engelmann spruce, grand fir, and many other conifers. Moderate sites may feature dense grand fir stands with snowberry, or more open and diverse forests with abundant western larch and Douglas-fir. Shrub understories may contain maple or chinkapin. The dominant herbs at moderate sites are vanillaleaf, starflower and twinflower. The drier areas of this zone have harsh, hot summers. Many of these sites are dominated by stands of Douglas-fir, and have lesser amounts of ponderosa pine or grand fir. They also include understories of elk sedge, oceanspray or other dry-site species. Riparian corridors feature diverse vegetation, and include western redcedar and western hemlock. The species in these riparian corridors are found in low precipitation areas, as well as in the moderate areas. The meadows in the zone usually have occasional occurances of grasses and herbs, such as tufted hairgrass, red fescue, clovers, and asters.

Successional development in this zone has patterns that are similar to the western hemlock and silver fir zones. However, they involve different species and rates of succession than the other zones. The drier, harsher sites may have prolonged open herb and shrub stages. The length of the stage varies with the severity of the disturbance. Grass species may provide abundant forage under natural and artificially seeded conditions. In these sites, the early species play important roles as site modifiers by enhancing soil nutrients (by nitrogen fixation), and by providing shady microsites where conifers can survive. Ponderosa pine and Douglas-fir are dominant conifers in these sites. In more moist portions of the zone, herb and shrub stages occur at rates that are more similar to the silver fir zone, and the early colonizing herbs may also be the same species. Douglas-fir, lodgepole pine and western larch may dominate the initial conifer layers in these sites. They are soon joined by grand fir and Engelmann spruce.

East Side Forests: The Ponderosa Pine Zone. The growing conditions in this zone are characterized by sparse rainfall and widely fluctuating temperatures. Hot Summer days give way to chilly nights. Winter temperatures are low, and high snow cover is possible. This zone is much like the continental interior of the western states, because most of the moisture from prevailing west winds fails to reach over the Cascade Crest. The zone forms a narrow band that is about ten miles wide on the eastern edge of the Forest.

Ponderosa pine, associated with Oregon white oak, make up this zone's forests. Douglas Fir is also occasionally associated. These forests are open, and allow sunlight to reach the ground. Bitterbrush, balsamroot and Idaho fescue are common. Numerous dry meadows feature bluebunch wheatgrass, and an extremely diverse flora of small annual flowers and numerous lilies.

Natural conditions within this zone have encouraged frequent wildfires, These are usually underburns, which burn off the shrub understory. Occasionally, these fires may kill entire stands. Prescribed underburns mimic the natural pattern of underburns that occur at about 20 year intervals. Forests develop as clusters of individual plants of various ages, instead of the more even-aged conditions that are prevalent in more moist forests. Most plant species within this zone are adapted to fire, and it is likely that some actually require fire to maintain suitable habitats, or to regenerate.

Map III-6 indicates the general locations of the six vegetative zones just discussed.

The Columbia River Gorge. On the north boundaries of the Forest lies one of Nature's unique formations: the Columbia River Gorge. It is the only sea level gap through the mountains between the Fraser River in British Columbia and the Klamath River in California. Over 1300 plant species have been identified within the entire Gorge! The land within the Gorge has the unique ability to demonstrate the relationship of decreasing moisture, and the transition of westside hemlock/Douglas fir forest into eastside ponderosa pine/oak forest. The Columbia River Gorge has numerous endemic species, which means that they have not been found growing anywhere outside the Gorge. The Gorge plant communities are also unique in several ways. The species composition and the geographic locations of species is distinctive. As an example, species and communities that are found elsewhere in high Cascades elevations occur close to sea level in parts of the Gorge. The vegetative diversity of the Gorge is a world-class natural resource.

Forage Component. Shrubs, grasses, and forb plants make up a "Forage Component" of the Forest's vegetative zones. The amount of sunlight that filters through the overstory determines the amount of forage growing in any part of the Forest. The areas of the Forest without an overstory support a forage component that is generally constant. The forage component is transitory in areas with an overstory component. The amount of forage area varies with the vegetative manipulation of the overstory, and the local fire history.

When the overstory is removed by timber harvesting, or by burning brush or hardwood, ground vegetation increases the forage component. As the overstory grows back and shades an area, the ground vegetation loses vigor. Eventually, the forage component declines. The rate of decline of this component depends on successional patterns and processes that vary with each zone, as discussed above.

The forage component is extremely important to animals that depend on it for food and cover. When livestock is introduced, it grazes on the forage component . "Transitory Range" is the term used to describe an area of the forest where the availability of forage for livestock is determined by the amount of overstory that is removed.

Map III-6 Vegetative Zones

Old Growth

Background

The fate of old growth forests on National Forest lands has become front page news. There are a variety of reasons for this publicity. The trees in these stands include a large quantity of highly valued wood. This has been the mainstay for local mills and economies since the advent of large-scale public land logging after World War II. Local counties and the Federal treasury receive large amounts of money from timber receipts following the logging of old growth.

During the past twenty years concerns for old growth have expanded to include wildlife, water quality, soil productivity, and other more technical topics. The expanding awareness of multiple old growth values has coincided with the scientific inquiry into old growth ecosystems. Recreational and aesthetic value has increased as old growth has been largely eliminated from private lands in the Pacific Northwest (Marcot et al. 1989, Greene 1988). Big trees and virgin forests have become unusual on our local landscape. American concern for global deforestation, particularly in the tropics, has also increased the attention of the public and the media to forest management issues closer to home (Norse 1990).

Definitions

The term "old growth" evokes a variety of images and emotions. Different interests lead people to focus on different parts of the forest features (Hunter 1989). Some define old growth based solely on the age or size of the trees. Others are concerned with wildlife habitat value, the structural features of the stand or stand size and placement on the landscape (Society of American Foresters 1989). Special sub-categories are popularly discussed. They include "ancient forests", classic old growth and super old growth (Morrison 1988).

Two definitions are most widely accepted, and are used in the Mt. Hood National Forest FEIS. They are the Pacific Northwest Research Note PNW-447 (Franklin, et al 1986) and the Pacific Northwest Regional Guide.

Table III-4 Summary of Minimum Standards for Old Growth Characteristics by Forest Zones

Where Appropriate	Live Trees	Canopy	Snags	Fallen Trees
Definition: PNW-447				
Douglas-fir dominated stands Western hemlock zone lower portion silver fir zone	2 or more species Douglas fir ≥ 8 per acre 32" dia or > 20 yrs plus shade tolerant trees ≥ 12/ac of > 16" dia	Deep, multi-layered canopy	Conifers ≥ 20" dia and 15' tall	≥ 15 tons/ac including 4/ac ≥ 24" dia and > 50' long
Definition: Regional Guide				
Western hemlock + silver fir zones	Shade tolerant and intolerant species, ≥ 5 trees/ac > 32" dia	Multi-layered, 60% of overstory with large trees, some broken tops & slowed height growth and heavy, gnarled limbs	≥ 2/ac	3 tons/ac including 3 logs/ac
Grand fir + eastside Douglas fir zones: mixed conifer area	Shade intolerant + tolerant; > 15 trees/ac ≥ 21" dia	Multi-layered, may include broken tops	≥ 2/ac	3 tons/ac including 3 logs/ac
Mountain hemlock zone	≥ 5 dominant trees/ac	Highly defective, numerous broken-topped trees	≥ 5/ac	> 20 ton/ac

The Mt. Hood National Forest does not have a detailed inventory of forest stands which includes all of the structural attributes of old growth, as defined by PNW-447 and the Regional Guide. We have used our forest vegetation inventory (Veg 88) to approximate these definitions.

The Forest definition is primarily based on interpretation of aerial photographs, which convey information about the composition and size of overstory tree species (Table III-5)

The Mt. Hood National Forest uses an approximation of PNW-447 for Douglas-fir dominated stands of old growth in the western hemlock zone, and below 3600 feet in the Pacific silver fir zone in the western Cascades. The Region 6 Guide definitions for various forest types (USDA Forest Service 1984) are approximated from our aerial photo data.

Other components of old growth, such as snags, down wood, and understory composition cannot be determined when using aerial photos. Harvested areas are updated to 1988.

Table III-5 Minimum Stand Criteria Used on the Mt. Hood National Forest

Definition	Crown Closure	Live Overstory Tree Size	Midstory Canopy
PNW-447			
This definition is applied to Douglas-fir stands and Pacific silver fir below 3600' elevation.	> 50%	≥ 32" diameter OR ≥ 21" diameter and crown diameter > 23'	
	20-50%	≥ 32" diameter and multistoried OR ≥ 21" diameter with crown diameter > 23'	Shade tolerant trees present and mid-canopy ≥ 8" diameter with > 10 percent cover
Pacific Northwest Regional Guide			
This definition is applied to Silver fir zone above 3600 ft., mountain hemlock and mixed conifer zones.	> 50%	≥ 21" diameter	
	20-50%	≥ 21" diameter and multi-storied	Mid-level canopy trees > 20'

Additional information about old growth values and characteristics are in the timber, vegetation, wildlife, diversity and fire sections of this chapter.

Relationship to Natural Environment

The distribution, abundance and composition of old growth in pre-settlement times depended on interactions among climatic, biological, and fire factors, as well as Native American activities. Conifer forests in the Pacific Northwest are world-renowned for the presence of giant trees. The largest known individual trees for the major conifers are found in this region. They include Douglas-fir, western hemlock, western redcedar, noble fir, and, ponderosa pine.

Historic old growth forest.

Climate

The Mt. Hood National Forest covers a great variety of forest types that correspond to major climatic differences. Climate and soil factors influence the ability of tree species to grow to a large size and reach old age. Moisture and wind patterns also influence the return of catastrophic fire or blowdown events. These prevent stands from growing old or large enough to be considered as old growth.

Much of western Oregon was covered with a mix of old growth and younger stands before logging began. These stands established themselves after large scale wildfires had burned. The forests of the lower, westside of the Forest were typical of stands covering several million acres in the Pacific Northwest (Halverson et al, 1986). Middle elevations (3000-4500 ft.) on National Forest lands have much colder, wetter climates (the Pacific silver fir zone; Hemstrom et al. 1982). These sites supported stands dominated by Douglas-fir, Pacific silver fir, noble fir, western hemlock and western white pine. Though trees in this zone often achieved great age, their sizes were generally smaller than the trees growing at lower elevations where more a favorable climate allowed gigantic trees to persist. Mountain hemlock and silver fir were the major species in the cold and snowy higher elevations).

Precipitation levels decrease rapidly as one travels east across the Cascade range. The eastern Cascade forests were structured by drought and fire. Grand fir, larch and Douglas-fir dominated the wetter, higher elevation. Ponderosa pine, Douglas-fir and Oregon white oak dominated the lower, drier sites (Topik et al. 1988).

This zonation of forest types and productivity has reflected larger, global scale climatic shifts. Forest zones moved up in elevation as the last ice age ended about 15,000 years ago. The present plant communities have been established for only the past 6,000-10,000 years. (Henderson et al. 1989). If global warming occurs during the next century, there will be substantial effects on the tree growth, reproduction and mortality processes which control old growth forests. Table III-6 shows the acres of old growth in the various vegetation zones of the forest.

Table III-6 Existing Old Growth Acres by Vegetation Zone (Roads and Streams Removed)

	Old Growth	Total Acres
Grand fir[1]	69,003	147,997
Mountain hemlock	52,233	103,802
Silver fir	132,083	414,991
Western Hemlock	9,981	282,069
Total Acres (forested)	345,300	998,860

[1] *The 183 acres of old growth located in the Ponderosa Pine Zone are included in the 69,012 acres of Grand fir.*

Fire History

Fire patterns determine the crucial aspects of old growth distribution, structure, and composition. The pre-settlement patchwork of old growth, mixed with younger stands, was the result of individual wildfires. Wildfire frequency and intensity are largely due to the combined effects of dry fuel conditions, accumulation of ample fuel, and sources of ignition. The geographic expanse and climatic variation of the forest relate to an equally diverse fire history. The western Cascade areas generally had fires about every 200-400 years that replaced whole stands of trees. The low elevation eastern Cascades area had frequent underburns about every 20-40 years. High elevations, ridgetops and the plateau along the Cascade crest have had large fires at fairly frequently intervals (about every 100-200 years). They occur because thunderstorms are more common at these elevations. They cause higher ignition rates when fuels are dry.

Windthrow and epidemic diseases also contributed to stand replacement patterns, and diversified the pattern of tree ages within individual stands. These mortality factors interacted with different fuel moisture or ignition rates to influence overall wildfire extent and severity. Mountain passes and nearby valleys experienced the greatest wind surges during severe storms. The dry climate on the east side probably allowed more extensive forest insects and diseases to kill large tracts of trees. These dead trees would enhance the chance of widespread forest fires.

The casual use of forest fires by Native Americans may have increased the overall wildfire frequency throughout the Cascades. We do not know if Native Americans intentionally set fires to manage forage or habitat on the Mt. Hood National Forest. It is likely that the areas near habitation centers, such as the Columbia River Gorge, had higher human-caused fire rates than other areas.

Ecosystem Composition, Structure and Function

Old-growth forest ecosystems have a variety of unique and special properties. The large tracts of old growth forests which dominated the Cascades before European settlement were home to a great variety of wildlife and plant species. The wildlife and vegetation sections in this chapter discuss the important role that old growth forests have for particular groups of species. These forests provided optimum habitat for numerous specialized species. Recent research of the Coniferous Forest Biome project of the International Biological program revealed a much greater complexity and variety of species in Douglas-fir dominated old growth than was previously believed (Edmonds 1982). Scientists are just beginning to catalog the species composition of the more obscure life forms, such as insects and soil organisms.

A great deal of the species diversity of various old growth forest types is due to the special structural characteristics of these forests (Franklin et al. 1981). The large trees, the variety of canopy layers, the variety of snags and large, down logs, and the varied understory vegetation allow more and different species to thrive than in young forest stands. Large trees, both alive and dead, provide direct habitat for many cavity nesting species as well as foraging and hiding habitat for other species. When these trees fall into streams, they provide crucial aquatic habitat. They also perform vital hydrological roles by holding stream sediments, absorbing high stream flow energy, and protecting channel stability.

The vast coniferous canopies of old growth forests provide a complex structural habitat for a unique arboreal ("in the trees") ecosystem of birds, insects, small mammals, plants and fungi. As an example, the nitrogen-fixing lichen Lobaria oregana is most abundant in old growth Douglas-fir stands (Pike et al. 1977). This lichen provides important nitrogen to the forest floor, and serves as a major forage item for small mammals such as the red tree role. These small mammals are the main prey items for birds, such as the spotted owl.

Vole/Lobaria

Many other functions of old growth forests enhance the long-term productivity of both vegetation and animals. Organic soil matter builds up from leaf litter, root death and large wood. It increases the nutritional status and moisture-holding capacity of the soil (Maser and Trappe 1984). The huge canopy area condenses fog, and greatly increases the amount of precipitation that reaches the soil. Stands with smaller canopy areas are less capable of affecting precipitation (Haar, 1985).

Landscape Patterns

Pre-settlement patterns of old growth varied by forest zones. Lower and middle elevations on the westside were dominated by large blocks of old growth. These stands had complex location patterns that reflected previous wildfires. They were eventually dominated by Douglas-fir trees that became established within about 50 years or so of the catastrophic burns. Within these large blocks, there were additional patches of stands created by smaller tree-killing events, such as blowdown or root-rots. The edges of old growth that adjoined younger conifer stands were often gradual, rather than abrupt. These edge areas allowed wildfires to burn cooler. The cooler fires resulted in lower mortality, and led to stands with a mix of different ages of trees.

The most burn-resistant sites were found in areas of high precipitation and moist soils. These groves harbored the largest and oldest trees, which are considered classic old growth. Throughout the Cascades, the valley bottom and stream-side areas provided large old growth corridors that were dominated by the largest and most-structurally diverse forests of the region.

Eastern Cascade areas had quite different old growth patterns because of the prevalence of frequent underburns. This area was dominated by open, park-like stands of ponderosa pine of various ages. These stands had few trees per acre, but they had the structural characteristics of old growth. The size of old growth stands may have been smaller than on the westside because of the greater topographic-related climate differences. Species composition east and west facing slopes varied considerably on the eastern edge of the forest. The differences were much more subtle on the west side.

Snags, down logs and scattered live trees remained after the wildfires. These pieces of the previous stands provided a legacy of structures for habitat and ecosystem function that link the old and the new stands.

Relationship to the Human Environment

Native American Impacts

Human impacts were fairly low on old growth forests before European settlement. Native Americans increased the overall fire frequency a small amount, but we lack evidence of widespread forest burning in the Mount Hood area. The Columbia River Gorge was a major habitation and trade center and so probably had much greater impacts than other portions of the Cascades. The use of forest products was limited to small-scale hunting, foraging and building.

European Settlement

Early use of the Forest involved minimal timber harvest and high levels of livestock grazing. The biggest impacts on old growth were the large number of wildfires that occurred about 1902. They may have been human-caused. These fires burned several hundred thousand acres of forest, including a large amount of old growth in the Bull Run, Eagle Creek (Estacada Ranger District), and Columbia River Gorge. The remaining extensive tracts in Bull Run occur partly because of its very moist climate. Stand-replacing fires rarely occurred in those climates. A number of small mills and railroad logging systems were scattered around the Mt. Hood National Forest, and had localized impacts on old growth. During the late nineteenth and early twentieth centuries timber cutting on private lands began to reduce the regional amount of old growth. This marked the beginning of the isolation of National Forest groves.

Post-World War II Logging Boom

Timber harvest of National Forest lands increased dramatically as the demand for wood increased in the 1940's and 1950's. During the 1930's about 1500 acres of old growth was logged on the Forest. This jumped to over 30,000 acres during the 1950's and about 50,000 acres during the 1960's. Harvest patterns resulted from the dispersed clear-cut method, where 30-60 acre patches were cut from the mix of mostly old growth trees. Early harvest emphasized lower elevations where large, old growth stands prevailed.

The local timber industry has provided raw materials for many thousands of homes and other buildings. Over 1000 jobs are directly dependent on milling this old growth timber, and millions of dollars are returned to the Federal and county treasuries each year from the sale of old growth. The Timber section of this chapter includes more information about the economic benefits of timber harvest.

Logging crew, circa 1920s.

Nontimber Uses

Old growth forests have many values related to wildlife, water, and recreation. Many species of wildlife use old growth for all or a part of their life cycle. For example, deer and elk, utilize old growth forests for forage, hiding and calving areas. Valley bottom old growth groves were important winter range sites. They provided thermal protection, as well as forage. High quality water for human consumption and fish habitat is another highly valuable attribute of these forests. Old-growth forests have been an attraction to hikers, fishermen and other recreationists seeking the quiet coolness offered by stands of huge conifers. The recreational value of old growth has increased in recent years. The elimination of old growth from private lands, as well an upsurge of public interest in old growth issues, has lead to the increase in recreational value. Some people have emphasized the aesthetic and spiritual values of old growth.

Fragmentation

The dispersed patch clearcut harvest pattern continued into the 1980's, and gave rise to the concern for the fragmentation of old growth stands (Harris 1984, and discussed in the Biological Diversity section of this chapter). The large stands with pristine characteristics have been replaced in many areas. Large, heavily logged and roaded areas now include small old growth stands. These stands include extensive edges, which feature environments dominated by climates and species from neighboring clearings.

Long-term Productivity and Forest Diversity

There is growing concern that the old growth successional stage may be an important step in ecosystem development which allows forest land to maintain high timber productivity over long periods of time. Obscure forest species, such as fungi that improve soil nutrients, may be adversely impacted by repeated short rotation forestry. Some feel that old growth plays an important role in maintaining pieces of the total ecosystem. These pieces are needed to maintain ecosystem production and function over the time. Old-growth may provide the genetic and species diversity required to allow continued ecosystem evolution, in relation to the large global changes which are likely to occur during the next century (Norse 1990).

Existing Situation

Acreage and distribution of old growth stands on the Mt. Hood National Forest is shown in Table III-7 and on Map III-7. This map and this table are the Forest's approximations at the PNW-447 and Regional Guide defintions.

The Regional Guide definition is used primarily on the east side of the Forest.

The Regional Guide old growth definition is less restrictive than PNW-447 (see Table III-5). This explains why such a large area of old growth is mapped on the eastern portion of the Forest. These areas are dominated by mixed stands of grand fir, Douglas-fir and ponderosa pine. There are often sufficient old remnant ponderosa pine or Douglas-fir to meet the minimum old growth qualifications.

The more sparse distribution of old growth at the lower elevations of Clackamas, Estacada and Zigzag Ranger Districts is due to the extensive logging history, the large fires that occurred in the early 1900's, and the more restrictive PNW-447 definition used in this area. PNW-447 is used primarily on the west side of the forest.

Winter/thermal cover.

Map III-7 Distribution of Old Growth

Table III-7 Acres of Old Growth Habitat Types by Major Drainges

Major Drainage	Core Acres	Non-Core Acres	Total Acres
Lower Clackamas	17,400	13,300	30,700
Salmon River	12,400	10,300	22,700
Sandy River	10,500	10,600	21,100
Bull Run River	23,500	12,600	36,100
Columbia Gorge	16,300	11,700	28,000
Upper Clackamas	19,300	15,200	34,500
Oak Grove Fork	14,500	11,600	26,000
E. Fork Hood River	18,200	11,600	29,700
Miles Creek	16,500	10,200	26,700
W. Fork Hood River	4,200	3,300	7,500
Badger Jordan	13,500	10,600	24,100
White River	10,800	9,200	20,000
Collowash River	10,000	5,800	15,800
Hot Springs Fork	6,900	3,500	10,500
Fish Crk/ Memaloose	6,200	5,500	11,700
Total	200,200		345,300

A substantial amount of Forest old growth is in protected areas, such as wilderness (see Table III-8).

Table III-8 Existing Old Growth Acres/Timber Suitability (Roads and Streams Removed)

	Old Growth
Wilderness	38,400
Nonwilderness; not available or suitable for timber production	172,900
Nonwilderness; available and suitable for timber production	134,000
Total Acres	345,300

The old growth stands next to clearcuts or roads are thought to have diminished habitat value for old growth dependent species. Our fragmentation model highlights areas of old growth within 120 meters of clearings. Table III-6 shows that a considerable amount of the remaining old growth is in smaller, fragmented stands.

Management Concerns

Timber

Old growth logging has been mainstay of the local timber economy. It provides direct and indirect employment, and returns millions of dollars annually to Federal and county budgets. Forest products are a vital part of the national and international construction economy. If old growth harvest decreases, the cost of wood products and housing will rise (see the Communities section of this chapter for more economic information). Employment in several timber dependent communities is directly related to the level of old growth harvest on the Mt. Hood National Forest.

Wildlife

Old growth provides optimum habitat for a large number of wildlife species, including the northern spotted owl. The fragmentation, isolation and alteration of old growth on the National Forest and throughout the region has substantially decreased the amount of habitat available for these species. Considerable management efforts are aimed at inventories and monitoring the abundance and life history of some of these species. The long term viability of the old growth dependent species will be determined by their allocation to various management prescriptions and harvest options.

Old growth forests provide unique recreational experiences that are not available in young, managed stands. The connections to primeval, virgin forests is an experience being sought by more and more people. Scenic values, as well as consumptive uses such as fisheries, are also enhanced by the contributions of old growth forests. Many citizens value the aesthetics of old growth on their public lands. They may not actually visit these areas, but they value the knowledge that these virgin stands may exist for their future use, or for use by their children.

Watershed

Undisturbed old growth forests produce some of the highest quality surface water available. This water is directly used by a large portion of the Oregon's population. Pristine old growth stands also have different water holding snow storage, and release characteristics than young, managed stands. Water quality is discussed in detail in the Water section of this chapter.

Sensitive Species of Plants

Background

The Mount Hood National Forest includes both the eastern and western slopes of the Cascades, and has a wide variety of habitats. These habitats range from lowlands to alpine, and from very arid to cool and moist. This extreme variation has resulted in a large variety of plant communities and a diverse array of plant species. The unique geologic history, topography, and climate of the Columbia Gorge is responsible for the evolution of several rare plants that are found nowhere else.

Existing Situation

Two categories of plants receive special consideration from Forest land managers:

Threatened or endangered plant species are listed by the U.S. Fish and Wildlife Service under provisions of the Endangered Species Act of 1973. These species must be protected from adverse impacts. No threatened or endangered plants are known to occur on the Forest.

Sensitive species of plants are identified by the Regional Forester. Concern for their viability (ability to survive throughout their range) is great enough for special management needs to be considered. The purpose of this management is to prevent a condition which would require the species to be placed in a threatened or endangered category. The species included in the Regional Forester's list of threatened, endangered, and sensitive plants may vary. These changes occur because the list is reviewed and updated periodically. Since October 1989, the Oregon Department of Agriculture has maintained a threatened and endangered plant list. This list, prepared in accordance with Oregon Endangered Species Act, will provide additional input to the sensitive species listing process.

The Forest's list of sensitive plant species is comprised of species on the Regional Forester's list which have been documented, and those that are suspected to occur on the Forest (see Table III-9). Currently 49 species are listed. The locations of 39 sensitive plants have been documented. 10 others are suspected to occur. Of the 49 species, 11 are Federal Candidate 2 species. This means that they are under review for possible listing under the Endangered Species Act.

A species' rarity and vulnerability to habitat disturbance may require modification of projects which could adversely effect them.

Relationships to the Natural Environment

Sensitive plants occur throughout the Forest, on all Ranger Districts, and in a wide variety of habitats. The proportions of sensitive species vary from area to area. The highest numbers of sensitive species are found in moist habitats, in the Columbia Gorge, on Mt. Hood, and on the eastern slopes of the Forest. Fewer numbers are found on open ridges, cliffs, and other rocky sites. Most areas of high timber productivity are relatively dry sites, and have fewer sensitive species.

Sensitive plants may serve as indicators of the well-being of their environment. Extensive habitat alteration may cause declines in their numbers due to specific habitat requirements and vulnerability to change. Highly vulnerable species may need to have their population trends monitored.

Streptopus streptopoides (common name is kruhsea) is an example of a plant that is sensitive to change. It is a lily found in the Bull Run Watershed. This plant's optimum habitat consists of well-rotted logs and woody debris in old growth forests. It's population could be decreased or eliminated following a timber harvest or similar disturbance. Other species rely on the habitat provided by early seral stages, and benefit from timber harvesting. Natural or prescribed fire can be detrimental, neutral, or beneficial to sensitive plants. A fire which burns off vegetation that is encroaching on a meadow may improve habitat for the sensitive species residing there. Caution and consideration must be used when deciding about sensitive species management.

Relationships to the Human Environment

Timber harvesting and road building can severely impact populations of sensitive plant species. At the same time, the occurance of a sensitive plant species on a timber sale site can restrict an other wise desireable road and timber harvest. Fortunately, most sensitive plants occur in areas where neither timber harvesting nor other disturbing activities are likely to be scheduled.

Sensitive plants are of special interest to professional and amateur naturalists visiting the Forest. Nature photographers often travel great distances to capture a special plant on film. For many, the discovery of a sensitive plant provides some sense of assurance that it's associated habitat is still intact.

Table III-9 Sensitive Plant Species

*	Sensitive Plant Species	Common Name of Species	Ranger District[1]						
	Agoseris elata	tall agoseris	B	BS	(CL)	(CG)	E	HR	(ZZ)
	Agrostis howellii	Howell's bentgrass				CG		HR	
	Arabis furcata	cascade rockcress	B	BS	(CL)	CG		HR	
	Arabis sparsiflora v. atrorubens	sickle-pod rockcress	B			(CG)		HR	
X	Aster gormanii	Gorman's aster		(BS)	CL		E		(ZZ)
	Astragalus howellii v. howellii	Howell's milk-vetch	B						
	Bolandra oregana	Oregon bolandra				CG		HR	
	Botrychium lanceolatum	lance-leaved grape-fern	B	(BS)	CL	(CG)	(E)	(HR)	(ZZ)
	Botrychium lunaria	moonwort	B	BS	CL	(CG)	E	(HR)	(ZZ)
	Botrychium montanum	mountain grape-fern	B	(BS)	CL	(CG)	(E)	(HR)	(ZZ)
	Botrychium pinnatum	pinnate grape-fern	B	(BS)	(CL)	(CG)	(E)	(HR)	(ZZ)
	Calamagrostis breweri	Brewer's reedgrass	(B)	(BS)	(CL)	(CG)		HR	(ZZ)
X	Calochortus longebarbatus v. longebarbatus	long-bearded mariposa-lily	(B)	(BS)				(HR)	
	Campanula scabrella	rough harebell			(CL)		E		
	Carex limnophila	pond sedge			(CL)	CG	(E)	(HR)	ZZ
	Carex macrochaeta	Alaska long-awned sedge				CG		(HR)	
	Cimicifuga elata	tall bugbane				(CG)	(E)		(ZZ)
	Lycopodium annotinum	Gold tread		BS					
X	Corydalis aquae-gelidae	cold-water corydalis		BS	CL	CG	E		ZZ
	Draba aureola	golden alpine draba		(BS)	(CL)	(CG)	(E)	(HR)	ZZ
X	Erigeron howellii	Howell's daily				CG		(HR)	ZZ
	Erigeron Oreganus	Oregon daily				CG		HR	
	Fritillaria camschatcensis	Indian rice				CG			(ZZ)
	Hackelia diffusa v. diffusa	diffuse stickseed				CG		(HR)	
	Hieracium longiberbe	long-bearded hawkweed				CG		HR	
X	Howellia acquatilis	howellia				(CG)		(HR)	
	Lewisia columbiana v. columbiana	Columbia lewisia	(B)			CG		(HR)	
X	Lomatium laevigatum	smooth desert-parsley						(HR)	
	Lomatium watsonii	Watson's desert-parsley	(B)					HR	
	Lycopodium annotinum	Stiff club moss	(B)	BS	CL			HR	
	Lycopodium complanatum	fir club-moss	(B)	(BS)	CL	(CG)	(E)	(HR)	ZZ
	Lycopodium inundatum	bog club-moss	(B)	(BS)	(CL)	(CG)	(E)	(HR)	(ZZ)

Table III-9 Sensitive Plant Species (continued)

*	Sensitive Plant Species	Common Name of Species	Ranger District[1]						
	Lycopodium selago	fir club-moss	(B)	BS	CL	CG	E	(HR)	ZZ
	Meconella oregana	meconella	(B)						
	Montia diffusa	branching montia			(CL)	CG	(E)	(HR)	(ZZ)
	Ophioglossum vulgatum	adder's tongue	(B)	(BS)	(CL)	(CG)	E	(HR)	(ZZ)
X	Penstemon barrettiae	Barrett's penstemon				(CG)		(HR)	
	Phlox hendersonii	Henderson's phlox	(B)	(BS)	(CL)	(CG)	(E)	HR	(ZZ)
	Poa laxiflora	loose-flowered bluegrass			(CL)	(CG)	E		(ZZ)
	Potentilla villosa v. parviflora	villous cinquefoil				(CG)		HR	(ZZ)
	Ranunculus reconditus	obscure buttercup	(B)					(HR)	
X	Rorippa columbiae	Columbia cress				(CG)		(HR)	
	Scheuchzeria palustris v. americana	Scheuchzeria		BS	(CL)	(CG)	(E)	(HR)	(ZZ)
	Scribneria bolanderi	Bolander's grass	B					(HR)	
	Sisyrinchium sarmentosum	pale blue-eyed grass		BS	(CL)		E		
	Streptopus streptopoides	krusea				CG	(E)		ZZ
	Suksdorfia violacea	Violet suksdorfia				(CG)		(HR)	
X	Sullivantia oregana	Oregon sullivantia				CG		HR	
	Tauschia stricklandii	Strickland's tauschia				CG		(HR)	

** An "X" in left column indicates the plant is being considered for T&E status.*

( ) = Suspected Occurrence

[1] *B = Barlow; BS = Bear Springs; CL = Clackamas; CG = Columbia Gorge; E = Estacada; HR = Hood River; ZZ = Zigzag*

Management Concerns

The Mount Hood National Forest management direction states that the Forest shall do the following:

- Maintain viable populations of all native plants,
- Prevent the need for their placement on State or Federal threatened or endangered lists,
- Protect and/or improve habitat for the perpetuation of endangered, threatened or sensitive plant species.

Biological evaluations shall be prepared for projects authorized, funded, or conducted on Forest land to determine the possible effects the proposed activities will have on threatened, endangered or sensitive plant species (FSH 2670). The biological evaluation consists of four steps:

- A pre-field review of existing information.
- A field reconnaissance of the project area.
- A risk assessment to identify the level of risk to threatened, endangered, or sensitive species that may be impacted by the project.
- If insufficient data exists to complete Step 3, a botanical investigation may be required.

If a management decision is reached at any stage of this four-step procedure so that the project is authorized to proceed, reasons for the decision must be fully documented in the Environmental Assessment (EA).

If activities are likely to impact sensitive species that are candidates for Federal listing, the Forest may contact the U.S. Fish and Wildlife Service for informal consultation and technical assistance.

If Federally listed threatened, endangered or proposed species are found in a project area, consultation requirements with the U.S. Fish and Wildlife Service will be met, in accordance with the Endangered Species Act. Before such a project can be carried out, protection or mitigation requirements will be specified.

Plans for regular monitoring of populations will be adopted to identify any species which may require special site management to ensure perpetuation of the species.

To achieve all objectives, the Forest will adopt Species Management Guides for species which may frequently conflict with projects. Species management Guides prescribe management direction, monitoring, and protection for a species, based on the species' needs Those needs are assessed across it's entire range, rather than on a local population or individual site. Candidates for Federal listing as threatened or endangered will receive highest priority.

Fish

Background

The demand for fish from waters of the Pacific Northwest far exceeds the supply. The Mt. Hood National Forest is one of eight Oregon and Washington National Forests, within the Columbia River basin, which continues to provide substantial habitat for salmon and steelhead trout production. The Forest makes major contributions to Columbia River fish supplies, both wild and hatchery spawned. With its great diversity of aquatic habitats, ranging from alpine lakes to reservoirs and backwaters of the Columbia River, the Forest provides habitat for at least 48 known species of fish. The most culturally important species to the region are those within the salmonid family: trout and salmon. These include both anadromous and resident fish. Anadromous fish spawn and hatch in fresh water. They normally remain there one to two years, depending on the species' genetic inheritance. Young anadromous fish (called smolts) swim to the ocean, where they grow to maturity. The cycle is complete when the fully grown fish return to their freshwater birthplace to spawn. Coho and Chinook salmon, and steelhead trout, are the most abundant anadromous salmonids on the Forest. Resident fish complete their entire life cycle in fresh water. Rainbow trout and cutthroat trout are the most abundant of these.

Long-term fisheries production depends on the Forest to provide spawning and rearing habitat, as well as a quality source of fresh water for downstream fisheries and fish hatchery use. Maintenance of fish habitat and water quality is a major concern of the public, State and Federal natural resource agencies and members of The Confederated Tribes of the Warm Springs.

Resource Characteristics

Aquatic Habitat. Current stream surveys indicate that more than 1,600 miles of the Forest's streams support fish. More than 300 miles of those streams support anadromous salmon and steelhead trout. Another 500 miles of streams have habitats suitable for anadromous fish, but natural or man-made barriers prevent migration. It is estimated that about half of the blocked habitat could be made accessible. For example, approximately 140 miles of the Forest's stream habitats could be opened to anadromous fish production if passage were provided at a series of falls on the White River. The White River is a tributary to the Deschutes River (USDE Bonneville Power Administration, 1985).

About 100 lakes and reservoirs within the Forest provide habitats for salmonids. Most of the salmonids are resident trout. Approximately 4,000 surface acres of habitat exists. The major lakes include Ollalie, Lost, Monon, and Bull Run lakes. The major reservoirs are Timothy, Laurence, Clear, and Bull Run. Warm water game fish are found in many Forest ponds, in the Columbia river, and in the Columbia River's backwaters within the Columbia Gorge. Timothy Lake reservoir supports a major commercial and recreational fishery for crawfish.

To plan and manage aquatic habitats, it is important to understand the habitat's capability to produce fish under varying sets of conditions. For both resident trout and anadromous species, these estimates of habitat capability have been made using indices. The estimator for trout is called The Legal Trout Index (L.T.I.). For anadromous fish, it is The Smolt Habitat Capability Index (S.H.C.I.). A smolt is a juvenile anadromous fish that is ready to migrate to the sea. Habitat capability estimates assume that all available habitats are fully occupied. They estimate the number of legal trout or smolts which could be produced on an annual basis. The quality and quantity of aquatic habitat, or its general condition, may determine its capability of producing fish. Habitat condition is assessed by comparing how well the species life history requirements are met by existing or proposed water quality and physical habitat features. Aquatic habitat conditions on the Forest are closely associated with the condition of the riparian areas because of their influence on water quality and physical habitat features.

Resident Trout. A variety of resident trout species are found on the Forest. These include: Rainbow trout (winter and summer run), cutthroat trout, Eastern brook trout (fall and spring run), Brown trout (early and late run), Redband trout, Bull trout, Kokanee salmon, Mountain whitefish. Rainbow and cutthroat trout are most common in the streams and rivers. Rainbow and Eastern brook trout are most common in lakes and reservoirs. Wild, self-sustaining populations of resident trout are found in most streams, and in about 30-50 percent of the lakes and reservoirs. A unique stock of wild redband trout has been identified in streams throughout the White River system (USDE Bonneville Power Administration, 1985). A population of native bull trout (formerly called Dolly Varden) listed as sensitive, occur in the Clear Branch Creek of the Hood River system (personal communication Jim Newton, District Biologist, Oregon Department of Fish and Wildlife ODFW). In areas with heavy fishing pressure, trout populations are often supplemented by periodic stocking with hatchery-produced trout. This stocking is done by the Oregon Department of Fish and Wildlife (ODFW). Popular streams that are stocked with legal-sized trout include the Clackamas River, Collawash River, Sandy River, Salmon River, Hood River, and the White River. Many reservoirs and lakes of the Forest's lakes are also stocked with fingerling or legal trout. A majority of these lakes are found within wilderness, scenic, or special interest areas.

The potential production index for legal trout, from all currently occupied habitat, is listed in Table III-10. According to current estimates, about 70 percent of the annual production capability is associated with stream habitats; The remainder comes from lakes and reservoirs. Approximately 50-60 percent of the trout fishing currently occurs in lakes and reservoirs.

It is important to note that Table III-10 is a presentation of the estimated existing and potential production capability of the waters on the Mt. Hood National Forest. The existing capability numbers are generally the high counts in the last five year period (1985-89). The potential numbers are estimates of what the existing habitat quality could produce if sufficient adults were available to spawn. They are not at this level at the present time for a variety of reasons. The off-Forest harvest is driven primarily by the numbers of hatchery fish available. Wild or naturally produced fish that are declining, or are attempting to make a comeback in the face of the high harvest rates, do not fare well. Little information is available on some stocks, and in those cases "unknown numbers" is used in the table.

Anadromous Fish. Four species of anadromous fish, as listed in Table III-10, use the Forest's stream habitats for spawning and rearing. These include: steelhead trout (summer and winter runs), searun cutthroat trout, chinook salmon, (spring and fall runs), and coho salmon (early and late runs). All major stream systems of the Forest support annual runs of one or more of these species. The Clackamas River is the heaviest producer of anadromous fish on the Forest. It provides 142 miles of habitat,which is about 50 percent of the Forest total. The Clackamas also supports all anadromous species on the Forest, with the exception of Fall chinook salmon. It is followed by the Sandy River, Hood River, and Fifteenmile Creek watersheds in terms of total anadromous production.

A number of other wild runs of anadromous fish deserve attention. These fish are believed original stocks which have adapted over long periods of time to specific conditions within the watershed where they return generation after generation. To recognize their importance, the Oregon Department of Fish and Wildlife (ODFW) has developed a Wild Fish Management Policy. Wild stocks of salmon and/or steelhead occur in all of the Forest's major watersheds. The wild late run coho salmon in the Sandy and Clackamas rivers, native winter steelhead in the Clackamas, Sandy, Hood rivers and Fifteenmile Creek, and the native spring chinook runs in the Sandy and Hood River systems are stocks of concern. The native late run of coho in the Clackamas and Sandy rivers represents the last wild

Table III-10 Trout Potential Production Index

Habitat	Total Habitat	Species	Habitat Capability Existing Level	Habitat Capability Potential Level
Clackamas River	142 mi	Steelhead Trout	153,600 Smolts	201,500 Smolts
	142 mi	Coho	180,000 Smolts	624,000 Smolts
	93 mi	Spring Chinook	83,400 Smolts	474,000 Smolts
	142 mi*	Searun Cutthroat	Unknown #'s	118,200 Smolts
Sandy River	73 mi	Steelhead Trout	40,500 Smolts	132,000 Smolts
	73 mi	Coho	80,100 Smolts	316,700 Smolts
	43 mi	Spring Chinook	19,000 Smolts	229,000 Smolts
	3 mi	Fall Chinook	136,200 Smolts	136,200 Smolts
	73 mi*	Searun Cutthroat	Unknown #'s	77,400 Smolts
Hood River	54 mi	Steelhead Trout	18,700 Smolts	93,100 Smolts
	20 mi	Coho	5,000 Smolts	21,800 Smolts
	20 mi	Spring Chinook	Unknown #'s	60,000 Smolts
	1 mi	Fall Chinook	15,800 Smolts	15,800 Smolts
	54 mi*	Searun Cutthroat	Unknown #'s	54,100 Smolts
Fifteenmile Creek	26 mi	Steelhead Trout	1,400 Smolts	13,500 Smolts
	6 mi	Spring Chinook	None	6,400 Smolts
	26 mi	Searun Cutthroat	None	6,300 Smolts
White River	74 mi	Steelhead Trout	None	63,000 Smolts
	22 mi	Spring Chinook	None	23,600 Smolts
Streams	1650 mi	Resident Trout	599,300	756,900 Legals
Lakes	1400 ac	Resident Trout	741,400	856,600 Legals
Reservoirs	1900 ac	Resident Trout	171,000	196,600 Legals

Source: Mt. Hood National Forest Habitat Capability Index (1985) and Legal Trout Habitat Capability Index (1985).

**Probable historic range; current runs appear to be severely depressed.*

runs of coho fish in the lower Columbia River in Oregon. A petition to list this stock as Threatened and Endangered has been filed by Oregon Trout. The Fifteenmile steelhead stock is the eastern-most run of wild winter steelhead in Oregon (Subbasin Anadromous Fish Production Summaries, 1986, The Northwest Power Planning Council Production Planning Workshops-Draft). Preliminary observations indicate that a remnant of the Sandy River wild spring chinook stock continues to reproduce on the Forest in Still Creek and the Salmon River. The spring chinook in the Hood River may have a remnant native component. All of these stocks, along with the bull trout listed under the resident fish section need to be closely monitored to determine stock viability and management actions necessary to rebuild them.

The potential annual production index of anadromous fish, from all currently utilized habitat, is listed by species in Table III-10. In some cases, the index of Forest habitat capability is greater than existing observed production. The difference is largely a result of too few fish returning to fully use all available habitat. Numerous efforts, including the Northwest Power Planning Council's Columbia River Basin Fish and Wildlife program, and the US-Canada fishing treaties are aimed at increasing anadromous production from the Columbia River Basin.

In addition to anadromous production from the Forest's stream habitats, five major fish hatcheries are located on or adjacent to the Forest. All five hatcheries obtain all or most of their water supplies from the Forest's watersheds. These watersheds are shown on the map with municipal supply watersheds in the preceding section on water. Table III-11 summarizes average yearly production of anadromous fish from hatcheries using water from the Forest.

Table III-11 Annual Average Production of Anadromous Fish From Hatcheries Deriving a Water Supply From Mt. Hood National Forest Watersheds

Water Supply/ Agency	Watershed	Species	Average Annual Output
Clackamas/ ODFW	Clackamas[1]	Spring Chinook	1 million lbs.
Eagle Cr/ USFWS	Eagle Creek	Coho, Steel-head	.5 million lbs.
Sandy/ODFW	Cedar Creek	Coho	1 million lbs.
Bonneville/ ODFW	Tanner Creek	Fall Chinook	11.5 million lbs.
Cascade/ ODFW	Eagle Creek	Coho	2 million lbs.
Oxbow/ODFW	Herman Creek	Fall chinook	4 million lbs.

[1] *A substantial portion of hatchery water supply is also provided by wells located at the facility.*

Relationship to the Natural Environment

Fish species found on the Forest do not adversely impact the natural environment; their presence in water is normally an indication of good water quality. The natural environment, particularly riparian areas, does have extremely important effects on the numbers and species of available fish.

Salmonids need cool, clean running water and an adequate food supply. They need clean gravel beds for spawning. Warm-water game fish can tolerate warmer waters than the salmonids. Warm, quiet ponds and small lakes make ideal habitats for these species. Any natural or human-caused habitat disturbance will affect fish populations. Salmonids are particularly sensitive to changes in habitat and water quality. Their tolerance for change is narrow, and any extreme changes are generally lethal. Fish are also sensitive to suspended and bedload sediment. If spawning beds are covered with silt, deposited fish eggs will die, or fry will be unable to emerge from the gravel. Habitat Requirements of Anadromous Salmonids, 1979 provides an excellent review of physical and biological conditions necessary for the survival of these fish. Major factors can change the key habitat components of water quality, quantity and temperature, holding, spawning and rearing habitat, etc. The factors include removal of riparian vegetation, physical modification of stream channels,(including large woody material), soil disturbance and erosion, and introduction of toxic materials. Examples of these materials include gas, oil, herbicides and pesticides.

Because of their relative sensitivity to change, the salmonids have been selected as "an indicator species group" for aquatic habitats. This group of species is especially important for their commercial and game values. They are also important because they occupy a wide range of aquatic habitats on the Forest.

Relationship to the Human Environment

Salmonids are an economic and cultural factor of life in the Pacific Northwest. From pre-Columbian times to the present, these fish have occupied a significant part of the lives of many different kinds of people. These include Native American tribes, sport fishermen, commercial fishermen, and everyday people who simply enjoy watching graceful fish movements in clean waters. As fisheries have dwindled, their importance has been emphasized by the conflicts over the use of the resource.

Another important indicator is that more than 85 percent of the Forest's developed recreation sites are near water. These sites include streams, river, lakes, and reservoirs. Fishing is a highly popular activity on these sites. Many residents of the Portland-Vancouver Metropolitan area are attracted to the Forest's lakes and streams and look upon them as a vital component of the area's lifestyle.

Fish harvest contributes substantially to local economics. This is true for resident, as well as anadromous species. Economic benefits are generated primarily from recreational and commercial fish harvest. The financial values from existing habitats are estimated at about three million dollars per year for anadromous fish harvest, and about one million dollars per year for resident trout harvest.[1] The anadromous fish at the five major hatcheries provide additional values. These hatcheries depend on high-quality water from Forest watersheds.

[1] Based upon SHCI and LTI estimates, existing harvest and success rates, and USDA-Forest Service values for Region 6 for recreation and commercial fishing.

A continued decline of the Forest's fish habitat would cause a strong impact on neighboring communities. The Native American tribes would be among the most adversely effected. They depend on anadromous fish to earn a living, and for their cultural well-being.

Fishing clinic for children, Blue Lake Park.

The maintenance of aquatic habitats will impact human use of other Forest resources. Program activities such as timber harvest and livestock grazing can directly or indirectly alter riparian and aquatic habitat conditions. Table III-12 summarizes current resource program activities. This table displays their potential, associated effects on aquatic habitat.

As the preceding discussion suggests, events which substantially alter riparian areas or stream channels have an effect on fish habitat. These include Forest management practices, as well as naturally caused events. The net effect has been the reduction in fish habitat capability. This reduction results from a change in the diversity or complexity of aquatic habitats (ODFW, 1985). The degree of compatibility between various Forest activities and fish habitat maintenance is determined by several factors. They include the degree of soil/vegetation disturbance, the size and location of the affected areas, and the frequency and duration of the disturbing activity.

Table III-12 Resource Program Activities and Associated Effects on Riparian and Aquatic Habitats

Resource Program	Riparian and Aquatic Habitat Conditions Affected
Timber Harvest and Road Construction	Cover/Shade Vegetation Removal Accelerated Sedimentation Reduction in Watershed Stability Removal of Instream and Streamside Wood and Trees
Special Uses: (Small Hydroelectric, Municipal Water, Transportation Corridors)	Flow/Aquatic Habitat Reduction Reduced Fish Passage Water Quality Changes Accelerated Sedimentation Riparian Vegetation Removal Streamside Alterations
Developed Recreation and Summer Homes	Cover/Shade Vegetation Removal Harassment/Overharvest Accelerated Sedimentation Streamside Alterations
Motorized Dispersed Recreation	Cover/Shade Vegetation Removal Streamside Alterations Harrassment/Overharvest Increased Sedimentation
Grazing	Cover/Shade Vegetation Removal Bank Stability Accelerated Sedimentation
Nonmotorized Dispersed Recreation	Cover/Shade Vegetation Removal Streamside Alterations Removal of Instream Wood
Domestic Water Use	Flow/Aquatic Habitat Reduction
Wildlife, Scenic or Special Interest Areas Management, Wilderness	Restoration/Improvement/ Maintenance of Riparian and Aquatic Habitat

Summary of the Current Situation

The maintenance, restoration, and enhancement of fish habitats and water quality on the Forest are issues of great concern to many groups. These include the general public, State and Federal natural resource agencies, representatives of the Confederated Tribes of the Warm Springs, and Forest management staff. The unmet demand for fish resources, combined with the precarious state of many Columbia River runs of anadromous fish, make the coordination of activities of all concerned parties essential. These coordination efforts are reflected by Forest Service management partnerships with other agencies and groups.

There is close coordination with the Confederated Tribes of the Warm Springs. This is especially true for areas east of the Cascade crest, which involve lands ceded by the Tribes.

Current Forest management is derived from various laws, regulations, and policies that relate to water, fish, wildlife, and riparian ecosystems. Professional biologists provide advice concerning protection of fish, wildlife, and water when plans for resource management are being considered. Trade-offs involving costs or availability of resources, are often required.

Previous planning efforts could not fully address these trade-offs, because current resource data and analysis procedures were not available. For example, when timber production targets were set, the nature and magnitude of trade-offs to aquatic and riparian resources could not be fully evaluated. Today, managers of fish and water resources are very dependant upon newly developed methods of evaluation.

The need for more comprehensive riparian resource management is further amplified by the general downward trend in riparian and aquatic habitat conditions previously noted. The Water and Riparian sections of Chapter III provide additional discussion about habitat conditions. This trend is reflected by altered channel conditions. These include the loss of in-stream structure, which was caused mainly by the removal of large wood and logs following the 1964 flood. Altered stream channel conditions also occur due to channel straightening. These effects include the loss of channel length, and loss of off channel habitats such as side channels and ponds. Aquatic habitat loss also occurs from filling, down cutting, and increased stream temperatures associated with vegetation removal and channel widening. Timber harvest and road construction in the upland portions of many watersheds can increase the frequency and magnitude of "rain on snow" flood events. Riparian areas that have been changed by management activities are less capable of mitigating the effects of these flood events.

This trend in riparian and aquatic habitat condition has reduced the Forestwide fish habitat production capability. This has occurred because of decreased quantity of suitable habitat, and a reduction of the quality of available spawning and rearing habitat. As noted in Water section B.4, existing watershed conditions and trends suggest that the potential for future reductions in fish production capability would be relatively high if another major flood should occur.

An intensive study in Fish Creek, which is a tributary to the Clackamas River, has begun to provide quantitative descriptions of trends in aquatic habitat condition over the last 20 to 30 years. The quantity of accessible anadromous habitat has been reduced by an estimated 20-25 percent. Contributing factors include:

- Blocked access at tributary road crossings.
- Reduced channel length due to downcutting and straightening.

Reductions in the quality of available rearing habitat are reflected by the following factors:

- More than 30% reduction in low flow pool habitat.
- An 8-10°F increase in summer maximum stream temperatures.

Wide-spread reductions in hiding cover and general habitat diversity associated with an estimated 90% decrease in large wood and logs in the stream channel.

Although Fish Creek is not necessarily representative of all streams on the Forest, it reflects general conditions which

Kokanee Salmon can be caught at Timothy Lake.

are widely represented. The degree and magnitude of changes in aquatic habitat condition appear to be most closely related to the frequency, degree, and extent of past management activities.

Due to the significant unmet demand for anadromous fish resources, many people in the Pacific Northwest are looking for ways to increase fish production. Recent legislation (the Northwest Power Planning and Conservation Act) contains provisions for the restoration of anadromous runs. It prioritizes the achievement of substantial increases in wild fish products. This program calls for the rehabilitation of degraded habitats, and the enhancement of existing ones. It also focuses on a number of basin-wide management needs:

- More coordinated planning among a large number of groups -- especially fisheries and land-management agencies, the Tribes, utilities, and the public.
- Increased numbers of spawning adults to better fill the available habitat with young fish.
- Improved management of the remaining genetic diversity provided by current wild or well-adapted, naturally-reproducing fish runs.
- The maintenance, restoration, and improvement of riparian and aquatic habitats.

The rehabilitation and enhancement of aquatic habitats that have been degraded by human or natural events, could substantially increase the Forest's production of anadromous and resident fish. The investment required to carry out the total fish habitat rehabilitation program developed by the Forest is estimated at $10 to $20 million dollars, and would require at least 10 to 20 years to fully implement. It focuses primarily on two areas: improvement or restoration of the diversity of pools and riffles needed to nurse juvenile anadromous fish until they reach the smolt stage, and the provision of adult passage to areas of habitat which are currently inaccessible.

Table III-10 compares present production with projected production increases that would result from full program implementation.

Local fishing demands for resident trout are also large and are likely to increase. Data are limited, but current demand appears to be met by the supply from Forest lakes and reservoirs. Demand for stream fishing is far below the available opportunities at this time.

If the demand for trout fishing increases in proportion to the projected rise in the population of surrounding area populations the total supply will remain out of balance. One or more of the following steps will correct this imbalance:

- Increase habitat capability through rehabilitation.
- Increase the stocking of planted fish.
- Enact special regulations.
- Encourage increased use of less-accessible streams.

Residents of the nearby Portland metropolitan area and other nearby communities continue to express increased interest in habitat maintenance, rehabilitation, and enhancement. These are Forest management responsibilities. Fish planting, and the enactment of fishing regulations, are the responsibilities of the Oregon Department of Fish and Wildlife. A Forestwide program to restore and improve habitat for resident trout should substantially increase the ability of the habitat to produce legal trout. It is similar to the program described for anadromous fish, except that fish passage work would be a relatively minor component. The increases in production estimated to result from full implementation of this program are shown in Table III-10.

Management Indicator Species

Background

The National Forest Management Act (NFMA) requires the Forest Service to manage wildlife habitats to "maintain viable populations of existing native and desired non-native vertebrate species in the planning area." Because it is difficult to monitor all species at the same time, NFMA requires the Forest Service to identify Management Indicator Species (MIS) through the planning process, and to establish objectives to maintain and improve the habitats of indicator species. The primary assumption of this process is that indicator species represent the habitat needs of other species because they have similar habitat requirements. Spotted owls, for example, indicate the needs of a variety of animals which use old growth forests.

Wildlife species designated as MIS receive special attention. Special, often large areas are set aside for them on the Forest .

Existing Condition

Twelve fish, 4 mammals, and 2 birds have been selected as MIS. Selection of these species was based on the following criteria:

- Endangered, threatened or sensitive species identified on State and Federal lists for the planning area
- Economically important species that are commonly hunted, fished, or trapped
- Species that have limited or special habitat requirements that may be significantly influenced by

management practices. Limiting habitats are habitats which may be reduced below levels necessary to maintain viable populations by unconstrained management activities.

Table III-14 lists the species used as indicator species on the Mt. Hood, the habitat types they utilize, and their selection criteria.

Table III-14 Management Indicator Species (MIS), Their Represented Habitats, and Selection Criteria

Indicator Species	Habitat	Selection Criteria*
Spotted Owl	Old Growth	1,3
Pileated Woodpecker	Mature/Over Mature	3
Pine Marten	Mature/Over Mature	2,3
Turkey	Old Growth Ponderosa Pine/Oak	2,3
Silver-gray squirrel	Old Growth Ponderosa Pine/Oak	2,3
Deer	Early forest succession** Mature/Old Growth	2,3
Elk	Early forest succession Mature/Old Growth	2,3
Salmonids	Aquatic	1,2,3

Bolding *denotes ecological indicator species.*

**1 = Threatened, endangered or sensitive animal species on State and Federal list.*

2 = Species that are hunted, fished or trapped.

3 = Special habitat needs that may be influenced significantly by planned management activity.

***Grass/forb/seedling/sapling*

The following is a description of existing habitat conditions on the Forest for each indicator species.

Northern Spotted Owl

For more information on the existing condition of this species on the Forest, see the spotted owl section in this chapter.

The spotted owl was selected as a MIS because it represents old growth forest habitats. Since its selection as a MIS, it has been listed by USFWS as a threatened species under ESA.

Pileated Woodpecker

On the west side of the Forest, the pileated woodpecker is found in all communities except grass-forb dry hillsides, mountain shrubland, and chaparral. On the east side, it is found primarily in ponderosa pine, mixed conifer and white fir-grand fir forests.

No systematic surveys of pileated woodpecker habitats or populations have been conducted on the Forest. Information has been obtained largely from sighting records of Forest Service personnel. As a result of applying the Regional Guide requirements, a minimum of 96 animals are to be maintained on the Forest. (See Appendix F, Management Requirements and Process Paper for how habitat was defined on the Mt. Hood.)

The pileated woodpecker was chosen as an MIS because of its need for large snags, large amounts of down woody material, and large defective trees for nesting, roosting and foraging.

Pine Marten

The pine marten has some economic value as a fur bearer. It is an indicator species to mature or older forests with dead and defective standing and down woody material. It has a feeding area that utilizes several stand conditions that range from poles to old growth. Shrinking habitat and trapping pressure have led to concerns for its population viability, as well as its designation as an MIS.

On the west side of the Forest, the marten uses mature and old growth stages of temperate coniferous forest, high temperate coniferous forest, and mixed coniferous forest. On the east side, marten occupy mature and old growth stages of high elevation mixed conifer, white fir, subalpine fir, and lodgepole pine.

No systematic surveys of pine marten habitats or populations have been conducted on the Forest. Information has been obtained largely from sighting records of Forest Service personnel. As a result of applying the Regional Guide requirements, 231 animals are expected to be maintained on the Forest. (See Appendix F and Process Paper for how habitat was defined on the Mt. Hood.) Map III-8 shows pine marten and pileated woodpecker and pine marten habitat areas on the Forest.

Merriam's Turkey

Turkeys were introduced on the eastern portion of the Mt. Hood in 1961. They have become established, and have become an important game species on the Forest. They are highly mobile, and utilize much of the eastern portion of the Forest for at least part of the year.

Map III-8 Pine Marten and Pileated Woodpecker Habitat

There are at least 135,000 acres of turkey habitat on the Forest. Large white oaks and old growth ponderosa pine provide suitable habitat for turkey food, cover, and roosting habitat.

Turkey populations fluctuate yearly, and averages about 2000 birds. They provide an annual hunting expenditure of about $306,000 (ODFW per communication) to local economies.

The turkey was selected as a management indicator species because of its association with the pine/oak cover type found on the eastern portion of the forest.

Silver Gray Squirrel

The habitat used by the silver gray squirrel includes a variety of mixed ponderosa pine/Oregon white oak forests that range from fairly open, sparse stands, to dense clusters of pole-sized trees that include some larger pines. There are at least 135,000 acres of squirrel habitat on the Forest. Habitat for this species overlaps with the turkey.

Oregon Department of Fish and Wildlife (ODFW) estimates the average squirrel population for the east side of the Forest to be about 2000 squirrels. According to ODFW estimates, squirrel hunters contributed $78,600 in annual hunting expenditures to local economies.

Deer and Elk

Deer and elk utilize a wide variety of habitat types throughout their life cycles. The sizing and spacing of forage and cover areas is important for maintenance, growth and reproduction of deer and elk. Forage areas consist of the grass-forb, shrub, and open-sapling pole stand conditions. Cover areas are usually defined as having an overstory canopy, a sub-canopy, and a shrub layer with herbaceous portions. The overstory canopy should be able to intercept and hold a substantial amount of snow, and have dispersed, small openings.

The deer and elk section in this chapter provides details concerning the existing condition for deer and elk.

Deer and elk were selected as management indicator species because they are economically important game animals. Using 1989 big game statistics from ODFW and the 1985 RPA Values ($27.60) for big game, the revenue generated by big game is estimated to be $3,800,000 to local economies.

Salmonids

Because of their relative sensitivity to change, the salmonids have been selected as "an indicator species group" for aquatic habitats. This group of species is especially important for their commercial and game values, and because they occupy the spectrum of aquatic habitats on the Forest. These requirements are restrictive enough that it is reasonable to assume that if the life history needs of the salmonids are met, the needs of other fish species found on the Forest will be met. The salmonids found on the Forest are included in Table III-7. Please refer to Fish writeup for more information on the extent and condition of habitat for salmonids on the Forest.

Relationships to the Natural Environment

A high level of habitat diversity and species abundance greatly influences the stability of an area's wildlife environment. Stability is necessary to avoid an undesirable, abrupt change in animal populations. Management Indicator Species provide an important check on the health and viability of species in the Forest.

Relationships to the Human Environment

The knowledge that a variety of wildlife species are present on the Forest is a source of satisfaction to many people. Many people find relaxation and recreation by observing, photographing or hunting wildlife. The present indications show an increased demand for wildlife protection. The demand for observable wildlife exceeds the demand for hunting (USFWS, 1985).

Some indicator species play an important role in the Forest economy. Deer, elk, squirrel and turkey hunters provide revenue to local communities.

Woodpeckers and other insectivores (insect eaters) that utilize dead woody material help serve as a biological control of forest insects.

Martens play an important role in biological control of forest mammals such as mountain beaver, which destroy timber investments.

The maintenance of wildlife habitat, particularly sensitive species habitat, will prevent full use of resources in some areas. The human benefits of these resources will proportionately decrease.

Management Concerns

The Code of Federal Regulations (CFR) 219.27 has specific management requirements for meeting the goals and objectives for the National Forest System. In order to accomplish these goals and objectives, Management Requirement (MR) areas will need to be identified for the spotted owl, pileated woodpecker, and pine marten. Guidelines for establishing MR areas for these species are described below.

Spotted Owl

Spotted owls require mature or old growth stands of timber for nesting and feeding.

The spotted owl section of this chapter contains more details about spotted owl management concerns. For more specific information about site selections, see Appendix F of the FEIS and the PNW Regional Spotted Owl Guidelines (1988).

Pileated Woodpecker

Pileated woodpeckers need mature or old growth stands of timber for nesting and feeding. Habitat types, dispersal distances, and other habitat requirements are outlined in the Regional Guide. Specific habitat requirements used on the Mt. Hood are listed in Appendix F.

Pine Marten

Pine martens need mature or old growth stands of timber for nesting and feeding. Habitat types, dispersal distances, and other habitat requirements are outlined in the Regional Guide. Specific habitat requirements used on the Mt. Hood are listed in Appendix F.

Pine Marten

Merriam's Turkey

Identification of important habitat areas for turkey has been focused on the eastern side of the forest. Suitable turkey habitat should include an even distribution of mature, mixed conifer stand, older-aged oak stands, and early successional conifer stands. Forested and open grassy areas should be interspersed to provide breeding habitat. Forested stands should have overhead cover that is suitable for turkey's roosting (Crawford and Lutz 1981). Maintenance of winter habitat is a critical need.

Silver Gray Squirrel

Identification of important habitat areas for squirrel have also been centered on the eastern side of the forest. Silver gray squirrel habitat should contain a contiguous airborne (tree canopy) route around nests, and maintain a component of large oak and ponderosa pine for both food production and structural habitat. Corridors of suitable habitat and clusters of snags are important habitat components.

The food source of the squirrel is the major limiting factor. Oak acorns, pine cones, subterranean fungi and various berries form the bulk of the squirrels' diet. Acorn production appears to be highly variable from year to year, though little data is available in the Northwest.

Deer and Elk

Winter forage and thermal protection are critical habitat elements for deer and elk. Range condition is particularly important in low snowfall areas because of the critical nature of winter forage. Management efforts should be directed primarily in the ponderosa pine, Douglas-fir and portions of the grand fir vegetation series.

Knowledge of plant associations can help to determine the general climatic setting of sites, and can aid in evaluation of their winter range value. The ponderosa pine series associations remain snow-free for much of winter. The abundant grasses and bitterbrush in these associations are extensively utilized by ungulates (hoofed mammals) during winter and spring. By carefully managing timber in winter range, a useful mix of thermal cover and forage sites can be provided. The various plant associations have different timber growth and stockability. Plant associations may aid in prescribing appropriate silvicultural methods to provide necessary wildlife habitat.

The deer and elk section of this chapter provides additional information about management concerns for this species.

Salmonids

Salmonids need cool, clean running water and an adequate food supply. They need clean gravel beds for spawning. Any change in fish habitats, naturally caused or otherwise, will affect fish populations one way or another. Salmonids in particular are extremely sensitive to changes in habitat and water quality. The ranges are so narrow that any extreme change is generally lethal. Fish are also sensitive to suspended and bedload sediment; if spawning beds are covered with silt, deposited fish eggs will die, or fry are unable to emerge from the gravel. Habitat Requirements of Anadromous Salmonids, 1979 provides an excellent review of physical and biological conditions necessary for the survival of these fish. Major factors which can cause changes to key habitat components (e.g. water quality and quantity, water temperature, holding, spawning and rearing habitat, etc. . .) are: removal of riparian vegetation; physical modification of stream channels, including large woody material; disturbances and erosion of soils; and the introduction of toxic materials. Examples of these materials include gas, oil, and chemicals used to control vegetation and insects.

Threatened, Endangered and Sensitive Animals

Background

Threatened or endangered species are animals and plants listed by the U.S. Fish and Wildlife Service that are in danger of extinction, or are likely to become in danger of extinction throughout all or a significant portion of their range. The Department of Agriculture has directed the Forest Service to avoid actions which may cause a species to become threatened or endangered. Forest Service policy states that species at risk of becoming threatened because of their small numbers or critical habitat requirements are classified as "sensitive". Sensitive species on the current Regional Forester's Sensitive Species List are given the same management consideration as Federally listed species.

Existing Situation

Three Federally listed species are present on the Forest. The peregrine falcon (Falco peregrinus) is listed as endangered. The bald eagle (Haliaeetus leucocephalus) and spotted owl (Strix occidentalis caurina) are listed as threatened. Recovery plans have been developed for the eagle and falcon.

Peregrine eyries (nests) have historically been located along the Columbia River Gorge; some of these were on National Forest System lands. Prior to 1985, the peregrine falcon was considered a rare summer visitor, or a migrant on the Forest. In 1985, two peregrines were released from an artificial nest box and fledged in the Columbia Gorge by the Oregon Department of Fish and Wildlife (ODFW). Through hacking, three peregrines were produced in the Columbia Gorge in 1986. (Hacking is the release of young raptors by humans during the developmental period between fledging from the nest and total independence from the parent.)

Efforts to reestablish peregrines across the Forest are part of a cooperative program between the Oregon Department of Fish and Wildlife. The Peregrine Fund, and the Mt. Hood NF. The objective of the program is to reestablish nesting peregrine falcons throughout suitable habitat on the Forest. Under the agreement, ODFW has responsibility for coordinating the program with the U.S. Fish and Wildlife Service.

The bald eagle occurs regularly along the Columbia River and occasionally across the rest of the Forest during the winter months on the Forest. Eagles have been observed during the Spring-Summer period in various areas of the Forest, e.g. along the Columbia River, at Timothy Lake, in the Clackamas River drainage, and at the Pine Creek reservoir. There are no confirmed nest sites or communal winter roosts on the Forest.

Suitable nesting and roosting habitat does occur on the Forest. Using the Pacific Bald Eagle Recovery Plan as a guide, nine very general recovery territories have been identified on the Mt. Hood. Good potential recovery areas are shown in Map III-9

The spotted owl has been listed as a threatened species.

The spotted owl occurs and nests in old growth stands throughout the forest. A network of spotted owl reserves has been established on the Forest for the purpose of maintaining suitable owl habitat. (Additional information about spotted owl management can be found in the Spotted Owl section of the FEIS Chapter III.

Map III-9 Potential Bald Eagle and Peregrine Falcon Recovery Areas

Eighteen sensitive species occur on Forest. Table III-15 lists the species present, as well as their State and Federal status. Some of the species are not known to occur outside of the Mt. Hood National Forest.

Table III-15 Endangered, Threatened and Sensitive Animal species, Mt. Hood National Forest (Current as of 1989)

Species	Occurrence[1]	Oregon Status	Federal Status
Mammals			
Townsend's western big-eared bat (Plecatus townsendii townsendii)	D	Threatened	Candidate for T&E (requires more information)
White-footed vole (Arborimus albipes)	S	Threatened	Candidate for T&E (requires more information)
California Wolverine (Gulo gulo luteus)	D	Threatened	Candidate for T&E (requires more information)
Birds			
Common loon (Gavia immer)	D	Apparently extirpated	None
Ferruginous hawk (Buteo regalis)	D	Taxa of Concern (list 3)	Candidate for T&E (requires more information)
Northern bald eagle (Haliaeetus leucocephalus)	D	Threatened	Threatened
American peregrine falcon (Falco peregrinus anatum)	D	Endan gered	Endan gered
Greater sandhill crane (Grus canadensis tabida)	D	Taxa of Concern (list 3)	None
Northern spotted owl (Strix occidentalis cavcina)	D	Threatened	Threatened
Harlequin duck (Histronicus histronicus)	D	None	None
Black rosy finch (Leucosticte arctoa atrata)	S	None	None
Amphibians and Reptiles			
Larch Mountain salamander (Plethodon larselli)	D	None	Candidate for T&E status (requires more information)
Cope's giant salamander (Dicampton copei)	D	None	None
red legged frog (Rana auroa)	D	None	None
painted turtle (Chrysemys picta)	S	None	None
northwestern pond turtle (Clemmys marmorata)	D	None	Candidate for T&E status (requires more information)
Fish			
Redband Trout (Oncorhynchus sp.)	S	None	Candidate for T&E Status (requires more information)
Bull Trout (Salvelinus confluentus)	D	None	

[1] *D = Documented; S = Suspected*

Relationship to the Natural Environment

Threatened, endangered and sensitive (T, E, and S) species contribute to the overall diversity of life. They are part of the genetic, species and ecosystem diversity of the earth. Threatened, endangered and sensitive species serve as indicators of the well-being of the environment. A reduction in the numbers of individuals of a species, or the loss of a species, may signal subtle changes in the natural setting that are not readily apparent. Small populations of animals also contribute to the overall diversity and stability of the forest setting.

Extensive habitat alterations, or extensive timber harvest, may cause declines in species populations. Species which have adapted to a relatively limited or localized habitat are particularly vulnerable to small changes or loss of habitat.

Relationship to the Human Environment

Biologists are aware that large numbers of species have disappeared several times in the distant past. The majority of species that have lived on earth are extinct. Ecologists predict that extinctions will continue, and estimate that hundreds of thousands, or millions, of extinctions are likely to occur in the next few decades. Unlike past extinctions, the current extinction crisis is a result of the growing human population. Species are disappearing much faster than evolution can replace them.

Human life cannot exist without other kinds of life on earth. If we reduce the variety of life, we jeopardize resources that provide our food, medicines, clothes, energy, building materials,clean air, clean water, psychological well being, and many other benefits. Some of the plant species that enjoy widespread popularity are relatively recent discoveries. As an example, tomatoes were not eaten by natives of the American tropics, and were thought to be poisonous for centuries after they were introduced in Europe. Their heavy use is relatively new. Many benefits of endangered plant and animal species are still unknown to us. When a species is lost, its biological function and potential use to humans may never be replaced. (Norse et al. 1986)

For many people, the mere presence and continued existence of many species of wildlife is a source of satisfaction. People also enjoy viewing wildlife in their native habitat; this is especially true for rare or unusual species. The demand for wildlife viewing continues to grow.

T, E, and S species frequently come into conflict with human uses of the natural environment. Conflicts occur because extraordinary measures are sometimes needed to assure protection from adverse human impacts. Measures designed to protect T,E, and S species, including the abandonment of a proposed project, can significantly affect many forest projects and plans.

Timber harvest, road building, and recreational developments can directly impact many T,E, and S species. The northern bald eagle and the spotted owl are two of the species that depend on mature and old growth forest. This type of forest is also highly prized by people as a timber source. Habitat protection for these species will prevent the full use of other resources in some areas of the Forest.

Management Concerns

The Federal Endangered Species Act of 1973 declares that all Federal Departments and Agencies shall seek to conserve endangered and threatened species. The Oregon Endangered Species Act of 1987 required that all Federally listed species be included on the initial state list.

The Department of Agriculture Policy on Fish and Wildlife directs the Forest Service to *"manage habitats for all existing native and desired nonnative plants, fish and wildlife species in order to maintain at least viable populations for such species."*

The Region 6 Threatened and Endangered Species Program establishes management goals and objectives for the conservation of endangered and threatened species within the Region. They are designed to lead to the eventual delisting of plant and animal species, where possible. The Sensitive Species Program provides the goals and objectives to manage sensitive species and habitats to prevent a need for federal listing in the future.

Potential bald eagle nesting sites have been identified on the Mt. Hood National Forest (Map III-10), see page III-172. A bald eagle management plan will be prepared within two years after implementation of the Forest Plan. The management plan will identify potential nesting, roosting, and foraging habitat that is currently unprotected. Specific areas will be considered for protection by the creation of management areas. The actual management and monitoring of these areas will be conducted as part of Project Opportunity Area (POA) planning.

Existing peregrine falcon hacking sites, and the potential nest locations, are protected under existing Category A Management designations. A peregrine management plan will be prepared within two years after the implementation of the Forest Plan. Additional potential peregrine nesting regions have been identified.

Biological Evaluations are prepared for projects authorized, funded, or conducted on Forest land to determine the possible effects that the proposed activities will have on endangered, threatened and sensitive species. The biological evaluation process includes four steps:

Step 1: A pre-field review of existing information.

Step 2: A field reconnaissance of the project area.

Step 3: A risk assessment to identify the level of risk to endangered, threatened, and sensitive species that may be impacted by the project.

Step 4: If insufficient data exists to complete Step 3, a biological investigation may be required.

If a management decision to proceed with the project is reached at any stage of this four-step process, the reasons for the decision must be fully documented in the Environmental Assessment (EA).

If Federally listed threatened, endangered, or proposed species are found in a project area, consultation requirements with the U.S. Fish and Wildlife Service will be met in accordance with the Endangered Species Act. Before the project can be carried out, protection or mitigation requirements will be specified.

If activities are likely to impact sensitive species which are Federal candidates for listing as threatened or endangered, the Forest may contact the U.S. Fish and Wildlife Service for informal consultation and technical assistance.

Species management guides will be developed for all sensitive species occuring on the Forest. Guides will be developed at a rate of two-three per year.

Snags and Down Woody Material

Background

Dead and defective trees are common and important components of all natural forest stands. Snags and downed woody material that result from the growth and death cycle of trees provide a special type of habitat for various birds and mammals. Many birds and small mammals find roosting and nesting sites and food in snags. Some species excavate cavities in snags and a variety of cavity nesting birds make homes out of these cavities. These birds are especially sensitive to changes in the supply of suitable snag habitat. Management plans and guidelines for managing dead and defective trees on the Mt. Hood National Forest have been developed to comply with the National Forest Management Act (NFMA) policy.

Existing Situation

Unique and substantial habitat diversity can be found in downed large trees. The trunk provides food for woodpeckers. Limbs are used as lookouts by rodents, and as rest areas for birds. A variety of creatures find sanctuary under or within the log. Year after year, the slowly deteriorating trunk may develop fungus for mice to feed on, grubs for a hungry bear, and possibly a den for a coyote family. Different species use different types of snags and downed material for their various life functions.

The Forest provides habitat for at least 64 wildlife species that are heavily dependent on snags and downed woody material for part or all of their life cycles (Table III-12). The list includes 44 species of birds, 12 species of mammals, 5 species of reptiles and 3 species of amphibians.

A study was conducted to determine the biological potential of the primary cavity nesting species. Biological potential is the maximum production of a selected organism that can be attained under optimum management (Brown, 1985). Estimates of the background snag levels were based on randomly selected plots that were laid out throughout the Forest, by vegetative zone, for the Vegetative Resource Inventory. Data shows that the Forest's current snag level can support 40% of the biological potential of primary excavators. A viable population level for primary cavity nesters is between 40% to 60% biological potential (Thomas, 1979).

The current level of snag numbers is due to fire, as well as past timber harvest practices. The Salmon-Huckleberry Wilderness reflects the fire history of the area. Some of these reserved areas consist of young trees of even age and size classes, and have a limited number of snags present.

The forest manages for snags at 60% of biological potential on commercial land. Management at the 60% biological potential level will help to cushion the populations of cavity nesting species from catastrophic losses from fire and windthrow, and will assure that the Forest does not fall below Regional Guidelines.

Table III-16 Wildlife Species Dependent on Snags and Downed Woody Material (Known and Expected Occurrences)

Excavators*	
Pileated woodpecker	Williamson's sapsucker
Common flicker	Hairy woodpecker
Lewis woodpecker	Downy woodpecker
Northern 3-toed woodpecker	White-headed woodpecker
Black-backed, 3-toed woodpecker	Red-breasted nuthatch
Yellow-bellied sapsucker	Pygmy nuthatch
Secondary Cavity Users**	
Wood duck	Northern flying squirrel
Hooded merganser	Pine marten
Common goldeneye	Bushy-tailed woodrat
Black-capped chickadee	Big brown bat
Mountain chickadee	Little brown bat
Chestnut-backed chickadee	California bat

Douglas squirrel	Yuma bat
Western gray squirrel	Long-eared bat
Variety of Uses***	
Barrow's goldeneye	Osprey[1]
Harlequin duck	Bald eagle[2]
Bufflehead duck	Red-tailed hawk[2]
Spotted owl	Merlin[2]
Saw-whet owl	Rough-legged hawk[2]
Western screech owl	Peregrine falcon[2]
Barn owl	Ruffed grouse[4]
Pygmy owl	Ash-throated flycatcher[2]
Flammulated owl	California red-backed vole
Vaux's swift	Black bear[3]
Bewick's wren	Clouded salamander[3]
Winter wren	Western red-backed salamander[3]
House wren	Pacific giant salamander[3]
American kestrel	Rubber boa[5]
Tree swallow	Sharp-tailed snake[5]
Violet-green swallow	Ring-necked snake[5]
Purple martin	Racer
Western bluebird	Gopher snake[5]
Mountain bluebird	Northern-alligator lizard[3]

* *Excavate own nest in dead/defective trees.*

** *Use cavities created by excavator for nesting and/or denning.*

*** *Partial checklist of species that use dead/defective trees for:*

[1] *Nesting platforms, standing trees*

[2] *Hunting perches, standing trees*

[3] *Feeding, hibernation sites, down trees*

[4] *Courtship (drumming logs), down trees*

[5] *Escape cover, down trees*

Relationships to the Natural Environment

Snags and down woody material are an important and integral component of forest ecosystems. Snags meet the life requirements of birds and mammals that are dependent upon them, and also serve as future dead and down material that is important for mineral/nutrient cycling, and in natural forest regeneration. Fallen snags may also enter into the stream, and provide cover for fish and aquatic insects. A decline habitat can become a major limiting factor for the of wildlife that depends on it, which affects the overall diversity of forest life.

Relationships to the Human Environment

Woodpeckers and tree roosting bats play an important role in the regulation of destructive forest insects. Resident species of insectivores (insect eaters) may be more valuable as biological control agents than migratory species, because they forage on insects throughout the year (Brown 1985). Tree roosting bats forage on insects at night, while birds are roosting. This provides 24 hour attack against destructive insects.

Long-legged Myotis

These woodpeckers and bats serve as biological controls of forest insects, and have a positive, long lasting effect. Pesticide use usually results in a temporary setback of insect pests, and provides no control over future insect outbreaks. The biological control represents a cost cutting, economic benefit to the Forest.

Management Concerns

Previous silvicultural practices have concentrated on producing mostly even-aged stands, which result in a deficit of snags and down woody material. Past harvesting strategies indicate a high potential for the future reduction of most cavity-using species to less than 20% of their biological potential. This number has been determined to be less than the level required for self-sustaining populations. Snags and downed woody material is depleted in other ways. Some of these include firewood cutting, and the use of snags, cull trees, and other downed wood for wood chip products.

Concern for the decline of snag and downed material habitat have led to changes in management practices. In recent years, snags in old growth forests have been left standing in many timber sales, for the specific benefit of wildlife. Downed woody material has also been protected for wildlife use by retaining slash as wildlife cover.

The Forest has applied the Snag Recruitment Simulator for analysis of future snag management guidelines. This interactive model helps to determine snag needs for wildlife by determining the species that use snags in planning areas. It also determines the population level to manage in the planning area. The user can input various population levels for the species that are expected to occur within an area. The model calculates the falldown and recruitment rate of snags, and determines the number of green trees need to be made into snag. The model can help the user/planner to manage the populations over time, at various management levels.

It is assumed that the management of snags for primary cavity nesters will meet requirements for other snag dependent species. Wildlife tree retention, and MR areas for pileated woodpeckers and pine martens, are methods designed to achieve this goal.

Research has found that most species of cavity nesting birds prefer snags with a diameter of 15 inches or greater, and are selective about stage of snag decomposition used for both feeding and nesting (Gale 1973, Mannon 1980, Raphael 1980 cited in USDA-FS 1985). The needs of primary and secondary cavity nesters will be met more effectively by managing the larger snags at various stages of decay. These larger snags will remain standing longer, retain bark longer, and support a larger variety of wildlife.

Snag

Conflicts may occur between the various silvicultural practices, logging safety practices, and wildlife needs, when live or standing dead trees are selected. State Workman's Compensation Laws and the Office of Safety and Health Administration (OSHA) rules require a safe work area during timber harvest. The dispersion and types of wildlife trees will vary when complying with these rules. Dead or defective trees that may be considered as safety hazards to loggers usually:

- have weakened tops which exhibit rot or breaks
- have defective root systems
- lean into work area or equipment
- have large branches which exhibit decay or fracture.

The distribution of snags (uniform vs. patchy) will be determined on a site specific basis. Most literature suggests that snags provided in patches are more desirable than snags that are provided in a singular, uniformly distributed arrangement. Uniformly distributed snags provide for a greater number of pairs if:

- foraging substrate is also available,
- the arrangement provides a better distribution of populations,
- the populations are less vulnerable to the catastrophic loss of all snags in an area.

Some advantages to patchily distributed snags:

- the odds of providing for at least one pair of species with small territories is improved,
- the provision of foraging habitat is improved,
- accommodations are improved for species that won't nest in open habitats.

The creation of green tree snags that are suitable for use by primary excavators can be accomplished in several ways. Tree topping encourages heart rot, and increases green tree potential as nest trees. If the tree meets safety requirements, the tops can be blasted out of cull trees. Snags that are produced by girdling may have a low potential as suitable nest sites, because they may begin to decay from the outside. This results in a snag that has relatively sound and firm heartwood, with decayed sapwood on the outside. Another method requires that the heartwood be bored and inoculated with a suitable fungus, at the appropriate height.

Secondary cavity nesters will benefit by the construction of artificial nest boxes. They are not generally used by woodpeckers, or other primary excavators. The construction, installation, cleaning and replacement of these boxes can be costly.

The definition of the different types and sizes of down woody material that is desired in managed stands is an ongoing research need. Down woody debris is an important habitat component for many species of wildlife as cover, and for feeding, reproduction and resting. Management Requirement areas for pileated woodpecker and pine marten will be managed for large amounts of down woody material.

Deer and Elk

Background

The Mount Hood National Forest has a variety of deer and elk species. The west side is characterized by black-tail deer (Odocoileus hemionus columbianus) and Roosevelt elk (Cervus elaphus roosevelti). On the east side of the Forest, mule deer (Odocoileus hemionus hemionus) and Rocky Mountain elk (Cervus canadensis nelsoni) predominate. Deer and elk have been selected as Management Indicator Species for the Forest because of their economic/recreational importance. They are used as an indication of the condition of the grass/forb, and seedling/sapling habitat. The demand for deer and elk as big game species far exceeds the supply on the Forest.

Young buck in velvet.

Existing Condition

There is limited knowledge about the numbers and movement of deer and elk on the Forest.

Dense vegetation and topography limit accurate census. The Forest is using Oregon Department of Fish and Wildlife (ODF&W) numbers as an indicator of population trends.

ODFW has indicated desired population levels for deer and elk population for the Mt. Hood National Forest. These indicate 2,450 wintering elk and 13,410 wintering deer (ODFW 1986). In 1987, elk and deer were at 48 and 64 percent of the benchmark, respectively. 3,300 elk and 19,300 deer are allocated to Forest summer ranges when wintering herds are at the their average level.

Deer and elk populations are dependent on Mt. Hood National Forest land during all seasons of the year. Deer and elk habitat conditions on the Forest are discussed below. Map III-11 displays deer and elk emphasis recommendations.

Winter Range

Much of the Mt. Hood National Forest is covered by deep snow during the winter months. As result, herds of deer and elk that extend over thousands of acres during the summer months are confined during the to low elevation winter range areas. From November to May, winter range is critical habitat because it supplies deer and elk with thermal cover, a constant food supply, and hiding cover.

Thermal cover is an important feature of winter range because it offers protection against adverse weather conditions. The overstory of large trees buffers wind and provides insulation from the surrounding cold air. Optimal thermal cover supply forage in critical winter snow conditions. The multi-layered stands and large broad limbs are effective in filtering and holding large amounts of snow. The absence of snow allows elk to forage on understory vegetation when open areas with forage are inaccessible.

Forage requirements for deer and elk can double during the winter months because of conditions imposed by weather. Forage availability and accessability are particularly critical during the winter months, because does and cow elk are usually pregnant at that time.

Map III-11 Deer and Elk Emphasis on the Forest

Table III-17 Deer and Elk Hunting Demand

Hunting Unit	Hunter Success (%)				Total Hunter Day				Days Taken to Bag Animal	
	Deer		Elk		Deer		Elk		Deer	Elk
	Rifle	Bow	Rifle	Bow	Rifle/ Spent Day/ Hunter Season	Bow/ Spent Day/ Hunter Season	Rifle/ Day/ Hunter	Bow/ Day/ Hunter	Rifle/ Bow	Rifle/ Bow
Santiam	19	17	3	4	84,695 Days Total 6 Days/ Hunter Average Season	15,569 Days Total 10 Days/ Hunter Average Season	11,980 Days Total 7 Days/ Hunter Average Season	3,667 Days Total 7 Days/ Hunter Average Season	34/61	83/183
Hood River	7	13	0	29	3,147 Days Total 4 Days/ Hunter Average Season	630 Days Total 11 Days/ Hunter Average Season	1,249 Days Total 7 Days/ Huner Average Season	63 Days Total 7 Days/ Hunter Average Season	42/78	NA/26
White River	16	10	7	6	9,140 Days Total 4 Day/s Hunter Average Season	1,226 Day Total 8 Days/ Hunter Average Season	4,811 Days Total 10 Days/ Hunter Average Season	152 Days Total 10 Days/ Hunter Average Season	24/76	48/167

Hiding cover is the third component of winter range. Trees ranging from large saplings to large mature trees and vegetation provide hiding cover. They also help to minimize disturbances that cause animals to move away from usable habitat. Road density can also have a serious impact on deer and elk survival because they are displaced from preferred habitats. As a result, harassment occurs because of intermittent auto travel (USDA 1986). During winter, deer and elk face the combined stresses of snow, cold weather, limited food supply and pregnancy. Under these conditions, minor disturbances are likely to have an impact on survival and reproduction.

The winter habitat for deer and elk on the Forest has been identified as area having snow depths of less than 18 inches. Deer and elk winter range has been categorized as either normal winter or severe winter range. Normal winter range is defined as the land area used by animals during mild winters; these winters occur in eight or nine years out of every ten. Severe winter range is used during severe winter conditions, which occur one or two years out of every 10. It also includes areas that receive use during severe cold or snow conditions. This use may occur on an annual basis. See Map III-12 for location of winter range.

The definition of winter range on the west side of the Cascade Mountains is based primarily on elevation, with some additional criteria. These criteria reflect areas where field observations and radio telemetry work indicate animal use. Severe winter range generally lies below 2,200 feet on all aspects (the aspect is the direction that a slope faces). It also includes wet areas with special winter range qualities that are above 2,200 feet. These special range qualities include:

Map III-12 Winter Range

- Surface water present in small, dispersed areas.
- Gentle slope gradients.
- The occurrence of thermal cover around wet areas.

Normal winter range includes all land on south aspects below 2,800 feet. It also includes severe winter range, and any wet areas that occur outside of the elevation limits which provide winter range habitat.

The definition of winter range on the east side of the Cascade Mountains is determined from field observations by biologists from the Forest service and ODFW. Severe winter range on the east side of the mountains includes the lands that lie on all aspects below 2,600 feet. Normal winter range is determined from ground and aerial observations and telemetry studies. Normal east side winter range represents the area used by animals during the winter period, and includes severe winter range.

Summer Range

Summer range for deer and elk includes all areas which have not been identified as winter range.

Relationship to the Natural Environment

Deer and elk use a broad spectrum of stand conditions, which range from grass-forb areas to old growth forests. Deer and elk populations have generally expanded because of the increased forage production from silvicultural treatments of timber stands.

Relationship to the Human Environment

Oregon's human population is expected to increase over the next 50 years. The number of hunters (and the demand for hunting opportunities) is also expected to grow slightly. Hunter demand for big game is extremely high on the Mt. Hood National Forest. This demand is not reflective of good hunting conditions, but is an indication of the Forest's close proximity to a large urban area. The Forest is within the boundaries of three state hunting units: Hood River, White River, and North Santiam. Although these units are not all on National Forest land, the bulk of the hunting effort takes place on Forest land. Table III-17 shows hunter demand by hunting unit.

Most people enjoy seeing wildlife in their natural habitat. Deer and elk are particularly important because they are conspicuous and common. The demand for deer and elk viewing is greatly increasing. The activity of recreational wildlife watching is expected to grow.

Management Concerns

The limiting factors for deer and elk in the Oregon Cascades are the nutritional quality of forage, and the availability of optimal cover. Winter range is characteristically found in the low elevations along riparian areas that have little snow accumulation. In the past few decades, road building, timber harvest, recreation use and wildlife use have been intensely focused on winter range. The gentler, low elevation slopes are more accessible for road building and logging of mature and old growth trees than higher elevation slopes. For this reason, timber harvest rates are higher on winter range, and deer and elk are being concentrated into areas of less desireable habitat.

Management concerns are presently focused on winter range conflicts. Examples of conflicts include road building, and the harassment of deer and elk during calving periods. Road closures have been implemented, and timber harvests have been delayed to reduce the biological energy demands on the animals at critical periods.

Reproduction rates are at levels that are below optimum, and are believed to be caused by forage that is of low nutritional quality (G. Herb, personal communication). The management for quality forage through seeding and fertilization remain a management opportunity.

Northern Spotted Owl

Background

The Northern Spotted owl was recently listed as a threatened species by the U.S. Fish and Wildlife Service. It is also a threatened species by the State of Oregon. Spotted owls are associated with the multiple layered canopies of mature and old growth forests. Because of project activity, such as logging and recreation development, the amount of suitable spotted owl habitat has been declining on the Mt. Hood National Forest.

Map III-13 Spotted Owl

The Final Supplement Environmental Impact Statement (FSEIS) to the Pacific Northwest Regional Guide established a general definition for determination of suitable spotted owl habitat as well as management guidelines for protection of a viable population of Northern spotted owls on each of the 13 National Forests with spotted owl habitat. Through application of this definition, it was determined that 619,000 acres of suitable spotted owl habitat are present on the Mt. Hood National Forest (see Map III-13). The 66 management areas have been established to maintain a viable population of spotted owls. Each area is comprised of 1500 acres of suitable habitat. Twenty-eight areas are located on reserved land (e.g. Wilderness), and are called Reserved Network Sites. Thirty-eight areas are on lands managed for multiple uses. These are called Spotted Owl Habitat Areas (SOHAs).

Adult spotted owl feeding a juvenile.

Existing Situation

The FSEIS established general guidelines to describe suitable spotted owl habitat. Habitat definitions have been divided by the Cascade crest. The FSEIS definition of West side habitat includes the following criteria:

- Douglas Fir, Western Hemlock, Western Red Cedar, or Ponderosa Pine (in southern Forests) dominant stands.
- Elevation less than 4000 feet.
- An area greater than 30 acres.
- At least 300 acres of similar habitat within a 1.5 mile radius.
- An overstory with dominant trees greater than 21" dbh.
- 50% canopy closure.
- Trees over 200 years old.
- An understory that is multi-layered, uneven aged, with 40-100 year old conifers as dominants.
- Snags present in moderate to high numbers, with dominant sizes over 21" dbh.

Large down logs must be present. The FSEIS East side definition is similar:

- Douglas Fir, White Fir, Western Hemlock (in northern National Forests), Ponderosa Pine (mixed), and Shasta Red Fir (in southern Forests) dominant stands.
- Elevation less than 6,000 ft.
- At least 300 acres of similar habitat within a 1.5 mile radius.
- An overstory with dominant trees over 160 years old.
- A canopy closure greater than 60%.
- the understory must be multi-layered, with Douglas Fir and White Fir as the dominant species.
- Snags are present, with dominant sizes greater than 25" dbh.
- Down logs are present.

The Mt. Hood National Forest determined the acres of suitable spotted owl habitat by applying the FEIS suitable habitat definition to the updated Vegetation Resource Inventory (Veg 88). See the MR process paper for more information on how suitable habitat was defined on the Mt. Hood. 619,00 acres of suitable spotted owl habitat were mapped using this process. It should be noted that although spotted owl habitat contains many components of old growth (see Old Growth section in this chapter), it is not always synonomous with old growth.

The 619,000 acres of suitable spotted owl habitat can be divided into three categories: acres in non-reserved lands, acres in reserved lands (e.g. Wilderness), and acres in SOHAs. 398,000 acres of spotted owl habitat lie on non-reserved lands. Reserved lands contain 176,000 acres of suitable habitat. SOHAs have about 50,000 acres of suitable habitat. These 226,000 acres of spotted owl habitat are protected through reserved lands and SOHAs. No regulated timber harvest occurs on these lands. The only reduction in this habitat is from catastrophes, such as wind storms and fire. The remaining 398,000 acres of suitable habitat is managed for many different values. A reduction of total habitat acres occurs from timber harvest, recreation development, and catastrophes.

Thirty-eight Spotted Owl Habitat Areas (SOHAs) have been established to meet the FSEIS criteria. These management areas were placed on non-reserved lands that may be subject to timber harvest. Each management area is composed of 1500 acres of suitable habitat. Twenty-eight Reserved Network Sites (RNSs) were delineated in reserved lands. These management areas have been created using the same criteria that is used for SOHAs

Over the past 3 years, the spotted owl management network has been monitored for spotted owl occupancy and reproduction in accordance with the Regional Research, Development, and Management Applications program. Twenty-eight of the 33 SOHAs have been monitored, and 9 of the 28 RNSs have also been monitored. The results are displayed below.

Old growth forest is preferred habitat of the spotted owl.

Table III-18 Monitoring Results of Spotted Owl Management Network

Number of Sites	% With Reproduction	% Reproduction Unknown	% With No Pair	% Not Visited
38 SOHAs	47	29	13	11
28 RNSs	11	7	14	68

Relationships to the Natural Environment

Spotted owl habitat is found in the later stages of forest ecosystem development, which is basically mature and old growth stands. This habitat contains a variety of tree sizes and species with multi-layered canopies. The structure is diverse. It is dominated by relatively large trees, with abundant standing dead trees and fallen decayed trees to support prey populations. Many of the larger trees contain cavities, broken-tops, or mistletoe to support nesting for owls and other species. Spotted owl habitat also provides structural diversity in riparian zones, which promotes healthy and productive streams.

Spotted owls are an integral component of the natural environment. The Forest Service has designated the spotted owl as a management indicator species (see MIS section, FEIS Chapter III). Indicator species presumably represent the habitat needs of other species because they have similar biological traits. About 44% of all species in western Oregon feed or breed within old growth/mature forests. Habitat protection for the spotted owl provides habitat for over 200 other species that also use spotted owl habitat. These species include:

- Northern goshawk
- Vaux's swift
- pileated woodpecker
- silver-haired bat
- red tree vole
- northern flying squirrel
- pine marten

Relationships to the Human Environment

The wood products industry relies on the extraction of trees and tree stands that are suitable spotted owl habitat. Spotted owl habitat is preferred by the timber industry because of its relatively large size and ease of processing. Many communities and jobs are directly tied to the continued harvest of areas containing spotted owl habitat.

Many people feel that spotted owl habitat offers intrinsic and aesthetic qualities which cannot be measured in economic terms. They enjoy the peacefulness and solitude that the habitat has to offer. Mature and old growth forests provide a sanctuary from urban life, where people can find refuge from their troubles.

Management Concerns

Timber harvesting has decreased the amount of suitable spotted owl habitat on private land from 890,000 acres to 216,000 acres, in the period of 1962-1982. This is a reduction of 674,000 acres. 71% of the suitable spotted owl habitat in the Pacific Northwest is now on the National Forests. This places a large responsibility for spotted owl protection on Federal Land management agencies, such as the Forest Service.

The Department of Agriculture Policy on Fish and Wildlife directs the Forest Service to *"Manage habitats for all existing native and desired non-native plants, fish, and wildlife species in order to maintain at least viable populations for such species."*

The Region 6 Threatened and Endangered Species Program establishes management goals and objectives for the conservation of endangered and threatened species within the Region that lead to the eventual de-listing of plant and animal species. The Sensitive Species Program provides the goals and objectives to manage sensitive species and their habitats, to prevent a need for Federal listing as a threatened or endangered species at a future date.

Spotted Owl Habitat Areas (SOHAs), coupled with reserved land, will provide protection for 226,000 acres of suitable spotted owl habitat on the Forest. However, further habitat loss and continued fragmentation is likely to occur on the remaining 398,000 acres of suitable habitat, because of timber harvest and recreation development. Other species that depend on spotted owl habitat are also likely to decline. Catastrophic events will also reduce the amount of suitable habitat on reserved and non-reserved lands.

Research Natural Areas (RNA's)

Background

Research Natural Areas are areas largely unmodified and contain representative natural communities or features. All human activities in these areas are kept to a minimum so that natural ecological processes dominate. The Federal natural area system strives to preserve adequate examples of all the major ecosystem types in the country. The system of natural areas has three major purposes:

- Provide a baseline against which human activities can be monitored.
- Provide a setting for studying and learning about the mechanisms of natural processes in undisturbed conditions.
- Preservation of gene pools for typical and rare and endangered plants and animals.

The USDA Forest Service natural areas program has been active in the Pacific Northwest since 1930. Current direction for natural areas in this Region comes from the Interagency Research Natural Area Committee and a natural area scientist working for the Pacific Northwest Research Station (USDA Forest Service). The State of Oregon established a Natural Heritage Program in 1979.

It compiles a comprehensive state-wide classification of natural ecosystems, prioritizes conservation needs, and maintains a geographic database of these ecosystems, special species and geological features. The Natural Heritage program also assists public and private sectors to develop and manage natural area systems.

The Natural Heritage Plan (1988) provides a state-wide perspective that defines a discrete and limited natural area system. This system protects characteristic ecosystems that have scientific and resource management significance. The natural ecosystem elements represented by the existing and proposed RNA's on the Mt. Hood National Forest (Map III-14) are included in the discussion below.

Existing RNA's

The Forest has three designated RNA's occupying 1,736 acres. They are Mill Creek, Bull Run, and Bagby. All three exist in a condition relatively undisturbed by human activities, and their RNA designation indicates our intention that they will remain so. Only disturbances caused by natural forces will be allowed.

The Mill Creek RNA. This area occupies 815 acres of forest/grassland in a transition zone east of the Cascade Crest. It was established in 1971 to permit the study of relationships between plants, wildlife, and other components of the environment in a mosaic of Oregon white oak, ponderosa pine, Douglas-fir, and bunchgrass communities. This area has been used to study the distribution and role of conifer needle micro-organisms and plant classifications of the Grand Fir Zone and the Ponderosa Pine Zone.

Terrestrial ecosystem types represented:

- Bluebunch wheatgrass-Sandberg's bluegrass community
- Oregon white oak/bitterbrush/bluebunch wheatgrass

The Bagby RNA. This area, established in 1971, consists of two tracts of land in the Collawash River drainage totalling 560 acres. It is forested by stands of western hemlock and Douglas-fir, which are typical of mid-elevations in the western Cascades. It provides a site for the study of various ecosystem processes in undisturbed conditions. Recent studies carried out in this area include:

- Habitat type classification.
- Vegetation classification of old growth wildlife habitat.
- Amount and role of coarse woody debris in northwestern conifer forest.
- Distribution and role of conifer needle endophytes.
- Tree growth and mortality.

Terrestrial ecosystem types represented:

- Western hemlock/rhododendron-salal community
- Western hemlock/vanillaleaf community

The Bull Run RNA. This area, encompassing 360 acres, was established in 1966 to permit the study of forests in the transition zone between temperate and subalpine forests in the western Cascades. Within this area are mixed stands of western hemlock, Douglas-fir, Pacific silver fir, and noble fir. It has recently been used for community classification of the Silver Fir Zone.

Terrestrial ecosystem types represented:

- Silver fir/rhododendron community
- Silver fir/big huckleberry/beargrass community
- Silver fir/Alaska huckleberry community
- Silver fir/foamflower-Oregon oxalis community
- Silver fir/azalea-fool's huckleberry community
- Silver fir/devil's club community

Aquatic ecosystems represented:

- First to third order stream system in silver fir zone
- Flowing and pooled cold springs complex

Proposed RNA's

The Forest Plan can make recommendations to the Chief of the Forest Service for expanding the National Network of Research Natural Areas. Once an area has been identified for possible inclusion into the system, a report called an establishment record is prepared by the Regional Forester and Research Station Director. These reports are forwarded to the Chief. A proposed Research Natural Area does not officially enter into the system until the Chief signs a *designation order* for each RNA. The District Ranger shall then implement a management prescription for each RNA based on information contained in the establishment record. Each of the following potential additions was selected as an excellent site, which contains representative ecosystems that currently lack adequate protection.

The Bull Run Addition. This 417 acre site has been identified as a potential site by the Forest for at least a decade. It would extend the south and east boundaries of the existing Bull Run RNA to the natural ridgeline that runs north and west from Hiyu Mountain. This extension would clarify the existing boundary. The current boundary does not follow a recognizable topographic feature, and is very difficult to locate on the ground. This addition would enhance the protection and manageability offered to the many ecosystem types represented at this site.

Big Bend Mountain RNA. This 5,161 acre potential RNA also lies within the Bull Run Watershed and consists primarily of subalpine forests of Pacific silver fir, western hemlock, mountain hemlock, and Douglas-fir. The proposal originated in the early 1970's in recognition of the unique research values on the upper part of Big Bend Mountain. The characteristics of the area include untouched subalpine forests, spring ponds, and a subalpine lake. Adoption of a Big Bend Mountain RNA would improve the opportunity for research in subalpine ecosystems. Presently, there is great interest in this subject. Another benefit may be the possible use of the adjacent Fir Creek drainage as a baseline watershed. This site includes a variety of outstanding natural wetlands.

Terrestrial ecosystems represented:

- Silver fir/rhododendron/beargrass community in northern or central Cascades
- Silver fir/big huckleberry/beadlily on dry sites in northern or central Cascades
- Silver fir/rhododendron community
- Silver fir/big huckleberry/beargrass community
- Silver fir/Devil's club community

Aquatic ecosystems represented:

- First to third order stream system in north Cascades in western hemlock zone
- First to third order stream system in silver fir zone
- Subalpine lake in northern Cascades
- Montane vernal pond
- Sedge fen complex in northern Cascades
- Flowing and pooled cold springs complex

Gumjuwac-Tolo RNA. This 3,623 acre potential RNA is in the Badger Creek Wilderness, and represents a wide range of east side ecosystems. These include high-elevation forests of subalpine fir, Engelmann spruce, and western larch, mid-elevation forests of grand fir and Douglas-fir, and low-elevation stands of ponderosa pine. Intact drainages in the Gumjuwac-Tolo RNA would afford opportunities to study nutrient cycling and other natural processes in these environments. This potential RNA fills the need for research in mixed conifer forests. Most east side mixed conifer forests have suffered widespread, repeated disturbance.

Terrestrial ecosystems represented:

- Grand fir-Engelmann spruce/starry solomon seal community
- Grand fir/skunkleaf polemonium community
- Grand fir/snowberry community

Aquatic ecosystems represented:

- First to third order stream system in subalpine fir zone in northern Cascades

A map accompanying this discussion identifies the locations of existing and potential RNA's. The total area of the three proposed additions is 9,201 acres.

Potential Needs for Future RNA System Expansion

An inventory prepared by the Natural Heritage Program of the State of Oregon (Nature Conservancy) for the Columbia River Gorge National Scenic Area in 1988 and supplemented in 1989, identified four natural areas within the boundaries of the Mt. Hood National Forest containing significant plants and plant communities for RNA designation. These areas may be eligible for RNA designation and will be designated open space to protect their natural values in the National Scenic Area Management Plan. There are currently no formal RNA proposals for these areas. These sites and their outstanding features are:

Multnomah Basin. This site includes old growth Douglas-fir, Western hemlock, Pacific silver fir and noble fir forests, including numerous plant community types. This site also includes several small, excellent sedge and forb-dominated wetlands. Two natural area ecosystem types currently unfilled in Oregon would be adequately protected by designating this site an RNA.

Ruckel Creek. This small, steep watershed is a tributary of Eagle Creek. It represents the transition of westside to eastside forests in the central Columbia River Gorge. This site also includes high diversity grassy meadows and scrub Oregon white oak communities. These are an unfilled ecosystem type in the Oregon Natural Heritage Plan.

Tanner Creek. Stands of western hemlock and Douglas-fir old growth forests grow along the bottom of the drainage, and up the steep slopes on the west side of the creek. The mesic red alder community on the stream terrace would adequately protect an unfilled Natural Heritage Plan ecosystem type.

McCord Creek Meadows. A large, pristine complex of many wetland types constitutes the dominant feature of this site. Sphagnum bogs and shrub-dominated wetlands are well represented. The surrounding upland forests of Pacific silver fir, western hemlock, western redcedar and Douglas-fir provide a variety of montane plant and animal communities.

No other formal proposals for RNA's currently exist on the forest. The ecosystem sites below have been given high to medium protection priority by the Oregon Natural Heritage Data Base. Potentially, they could be represented by sites on the Mt. Hood National Forest. This list excludes ecosystem types that are specific to the Columbia Gorge National Scenic Area. Ecosystem types needing future evaluation include:

Terrestrial ecosystem element needs:

- Western hemlock/oceanspray community
- Silver fir/salal-Oregongrape community in northern or central Cascades
- Mountain hemlock/woodrush community
- Mountain hemlock/dwarf bramble-big huckleberry community
- Recent lahar (mudflow) with successional forest communities including lodgepole pine/pinemat manzanita
- Grand fir/vanillaleaf community
- Grand fir/elk sedge community

Aquatic ecosystem element needs:

- Low elevation lake in northern Cascades, surrounded by Douglas-fir-western hemlock forest
- Sphagnum bog in northern Cascades
- First to third order stream system in Grand fir zone in northern Cascades

Relationships to the Natural Environment

The designation of RNAs, by definition, provides maximum protection of natural processes and conditions. These areas are therefore compatible with the natural environment. If the environment of an RNA is disturbed, it will be due to purely natural events.

Each Research Natural Area is a piece of a large puzzle. The whole puzzle attempts to preserve functioning ecosystems that represent the major biological resources of the country. RNA's are important resources which serve as baseline sites. These sites can be contrasted against our managed ecosystems. As more acres of the Forest become managed for timber harvest and other development in the future, this monitoring function will become more vital.

Map III-14 Research Natural Areas

Relationships to the Human Environment

RNA designation of a site affects all major human activities that impact the environment. Activities that would disturb conditions in the RNA's are generally prohibited. This policy permits research and study of natural systems to take place. However, land allocated for RNA's can be used for activities which do not significantly disturb the area's natural condition. Watershed and wildlife values on established and potential RNA's should change little from their present condition. Back country hiking currently allowed in the potential Gumjuwac-Tolo RNA is not expected to compromise research values if continued at present levels.

As the amount of land involved in RNA's is small, their impact on the economy or lifestyles in the local communities is also minimal.

RNA's sites provide natural controls to our management activities. It is likely that the pursuit of future management activities will also require an accompanying commitment to research and monitoring. RNA's also protect natural gene pools. Knowledge gained from RNA research may provide long range human benefits.

Management Concerns

The question has been raised whether a RNA designation in the Bull Run Watershed Management Unit, pursuant to Public Law 95-200, would prevent salvage or other activities considered essential to protect water quality. Management activities of this nature may be needed after a catastrophe such as a wind storm. It is recognized that management activities needed to protect the water quality within the Bull Run watershed will take priority.

Fire

Background

Fires on the Forest vary in intensity and effect, as determined by climatic conditions, the amount of fuel available, and topography. Most of the Forest's precipitation falls in winter, which leaves the Summers comparatively dry. This climate, combined with other environmental factors, produces dense conifer forests with large accumulations of woody debris. This material may accumulate as snags, large logs, or as deep beds of needles on the forest's floor. When dry, these materials make excellent fuels. Forest fires start when the buildup of fuels combines with dry summers and lightning or other forms of ignition.

The affects of fire on the Forest environment can be beneficial or detrimental.

Prescribed fires follow a known prescription: They are deliberately set, and carefully controlled. A prescribed fire will remove logging slash and create small areas of mineral soil where tree seedlings can start to grow. If carefully executed, the burn may rejuvenate bitterbrush and improve the value of these plants for wildlife browse. A prescribed burn reduces the fire hazard, prepares a seedbed, and increases the food supply for deer and elk.

A wildfire may affect a stand very differently. A wildfire would kill most or all of the trees, and leave a stand of snags. The fire might also remove all of the duff and humus layers on the forest floor, and leave the soil vulnerable to wind and water erosion. Bitterbrush and other forage plants would be completely removed, and may be replaced by less palatable plants.

Fire may be used as a carefully controlled tool or as an agent of destruction. This dichotomy of effects is a basic factor in the Forest's fire management policies.

The goals of fire management on the Forest are to provide fire protection on the Forest, and to use prescribed fire as a beneficial tool. Maximum control of wildfires requires the prevention and suppression of all unplanned fires. The primary purpose of prescribed fire is to reduce accumulations of fuel, but it is also used for site preparation,and for the improvement of wildlife habitats. A closer look at recent fire history reveals the scope and complexity of these tasks.

Fire History

During the seventies, a total of 1,278 fires burned on the Forest. 13,597 acres were consumed. This represents 1.2 percent of the Forest's total area. These numbers decreased in the eighties, as 557 fires burned 1,095 acres on the Forest. The greatest number of fires were caused by people. Human-caused fires also consumed the most acres. Most of the human-caused fires were caused by recreational visitors. However, the fires which did the most damage and burned the most acres were started by logging operations and escaped slash burns.

The greatest number of fires began in stands of mature timber, but these fires did not cause the most damage. The worst fires, as measured by the amount of damage caused and the difficulty of control, started in logging slash. For example, during the seventies, only 3 percent of all fires larger than 1/4 acre started in slash. However, those 3 percent fires accounted for 85 percent of the total acres burned. Fire history for a 30-year period is detailed in tables III-19, III-20 and III-21.

Table III-19 Wildfire Causes and Acres Burned 1970-1979

Causes	Percent	Average Annual Number of Fires	Total Acres Burned
All Causes			
Lightning	18	27.5	109
Total Human-Caused	82	100.3	13,488
Total	100	127.8	13,597
Human Caused Fires			
All Industrial	11	11.4	11,438
Recreational	89	89.2	2,050
Total	100	100.6	13,488

Table III-20 Wildfire Causes and Acres Burned 1980-1989

Causes	Percent	Average Annual Number of Fires	Total Acres Burned
All Causes			
Lightning	29	16.4	59
Total Human-Caused	71	39.4	1,036
Total	100	55.7	1,095
Human Caused Fires			
All Industrial	14	5.7	569
Recreational	86	33.8	467
Total	100	39.4	1,036

Table III-21 Lightning-Caused Wildfires 1960-1989

Decade	Percent	Average Annual No.	Total Acres Burned
1960-1969	34	32.2	129
1970-1979	18	27.5	109
1980-1989	29	16.4	59
Total		75.1	297

During the late 1970's the numbers of fires started and acres burned both decreased. The reductions were achieved through a program designed to prevent fires that were caused by industrial operations. Increased care in slash burning was emphasized. The extra precautions helped to reduce the number of escaped slash fires.

Relationship to the Natural Environment

Vegetation. All types of vegetation on the Forest have co-evolved with fires of natural origin. The frequency and intensity of fire has largely determined the species of trees present. Because of this biological fact, the Forest's policy of fire suppression has had unexpected side effects. The build up of fuels in some areas of the Forest is one of these effects. The types of vegetation may also be in the process of changing.

Surface fires were a common occurrence in ponderosa pine before the advent of forest management. These fires reduced fuel loadings, and killed tree species that were sensitive to fire. The thick-barked pines thrived under a regime of frequent, low-intensity fires. These fires killed off competing vegetation, and provided a seedbed for light-demanding pine seedlings. As a result of fire suppression, shade-tolerant species of trees now grow under the pines, and may eventually replace the pines on the east side pines in the ponderosa pine zone. The continued harvest of old growth pines in the zone accelerates this trend.

Catastrophic fires, with long intervals between them, produced the large west side stands of old growth Douglas fir in the western hemlock zone. Intense fires periodically swept these forests. They burn through the deep accumulations of duff, and expose mineral soil. The thick bark and thrifty growth habit of the Douglas fir allowed it to survive intense fires at a higher frequency than other west-side species. This allowed the fir to "seed in" after fires, and to dominate post-fire succession. In some respects, the policy of clearcutting with slash burning has imitated this process, and allows the valuable Douglas fir to dominate managed stands.

Fires in the mixed conifer and true fir zones also tend to be intense, stand-replacing burns. Post-fire succession is less well understood in these stands. Fires is either of these zones often result in a mixture of species. Any combination of fire intensity can occur in any stand, depending on the key variables of climatic conditions, fuels, and topography.

The interaction between forests and fire in the Pacific Northwest is quite complex. Less intense, light fires which remain on the ground do not necessarily kill trees. In fact, such fires may remove fuel and thereby prevent a catastrophic fire. Intense fires, especially those which burn the heavy fuels on the west side of the Cascades, are often quite destructive and may kill all trees in a stand.

Wildlife. The interaction of fire and wildlife is another complex issue. Fire has short and long range effects, which can impact wildlife in a variety of ways. Some animals depend on old growth for habitat, while others need meadowlands or brush. The fire's effect on a particular wildlife species depends on several factors. These factors include the fire's size, location, intensity, and eventual effect on surrounding vegetation. A particular fire may inflict short-term damage by destroying food and cover for wildlife. Over a longer period of time, fire may help to maintain the habitat for a particular species. With the exception of catastrophic fires, which can destroy many animals, most larger species of animals can move away from a fire. Some animals, such as birds of prey, find food easier to obtain after a fire because of the dead and injured small mammals left behind.

Wilderness. The current fire-suppression strategy in Wilderness is to suppress fires as quickly as possible. Because fire has played a part in the natural ecosystems of the Pacific Northwest, the policy of immediate suppression of fires may, in some cases, have changed the natural characteristics of the Wilderness. The build-up of fuel, or changes in species composition, are problems which may need to be addressed in some Wilderness areas.

Due to these changes in fuel loadings and species composition, there is a proposal to allow ignitions from lightning to burn as prescribed fires. This change would allow fire to play a more natural role in Wilderness ecosystems. It would also permit fire to burn within prescribed limits, unless adjacent lands or human lives were endangered.

Other Resources. Fire profoundly affects other resources. The location, size, and intensity of the fire determines the magnitude of these effects. Intense fires are more likely to degrade resource values than light fires. Fires may affect water quality. This is particularly true when the fire is severe enough to burn away most of the vegetation. The loss of ground cover can increase erosion, sedimentation, and elevate water temperatures. Water runoff may also increase. Some resources are enhanced by wildfire occurrences. As an example, the yields of huckleberries often increase after a fire.

Relationship to the Human Environment

Most of the damaging fires on the Forest are caused by people, and the majority of these fires are the result of industrial operations. A reduction in serious fires can occur by careful slash disposal, and other preventive measures.

Communities around the Forest are affected by both wildfires and planned burns. Wildfire can damage resources and amenities that are used by people in these communities. If slash by burning is prevented, the potential for wildfires increases. This jeopardizes the future production of timber. An impact on community employment would follow, particularly in timber-dependant communities. If slash burning is allowed, the resulting smoke may impact air quality and the Forest's scenic values.

In order to preserve the natural character of some Wilderness areas, a policy to allow some natural but closely observed burning may be adopted.

The loss of highly valued recreation areas from a catastrophic fire is always a possibility. Recreational visitors may start fires from cigarettes, fireworks, or campfires. As noted above, these fires are seldom the most damaging.

Forest management for visual resources and wildlife may require the use of smaller clearcuts. Slash treatment of smaller clearcuts is far more expensive, and requires more labor per acre, than other treatments. The treatment of logging slash is desirable to maintain visual quality. Burning is often the most cost-effective and most natural-appearing method of slash disposal.

Wildfires may completely destroy structures, including administrative buildings, historical sites, and summer homes. Due to the small amount of private land within National Forest boundaries, only a few communities would be threatened by wildfires.

Management Concerns

Fire mangement on the Forest follows the maxim that "fire is a good servant but a poor master." Prescribed fire is regularly employed for the management of unwanted vegetation, where it is deemed to be ecologically sound and cost-effective. At the same time, concern over the destructiveness of wildfires has led to an aggressive policy of prevention and control.

A special management concern is to coordinate the Forest's fire-management program with other Federal, State, and local agencies. The Forest Service has a cooperative agreement with the State of Oregon and Warm Springs Indian Agency for fighting fires on adjacent lands. All agencies which deal with wildfires use educational programs to inform the public about fire prevention.

Timber Harvest. When old growth stands are logged, large quantities of highly flammable residues (slash) can be produced. Slash disposal is a major forest-management activity. Although slash may not always be burned, present silvicultural knowledge indicates that, on most sites, slash must be reduced to a specific level before new trees will grow. Burning is often the best method for reducing the level of slash.

Slash may be piled and burned at a late time, when weather conditions are favorable. Often slash is broadcast burned, which means that it is burned where it lies on the ground. Broadcast burning is preferred on sites where the use of machinery may compact the soil, or where steep slopes prevent the use of tracked vehicles. In some types of vegetation, broadcast burning closely approximates the natural fires which occurred on these forests before logging began. On a yearly basis, the Forest produces approximately 4,300 acres of clearcut logging slash and 1,500 acres of shelterwood cut slash. Additional timber-harvest activities, such as salvage logging, result in another 2,700 acres of ground which require slash treatment.

Fire Suppression. The fire fighting organization on the Forest is designed to detect, attack, and quickly suppress all fires in the most cost-efficient manner. A system of aerial flights and lookout staff is responsible for prompt detection during periods of high fire danger. A variety of aerial and ground forces, including air tankers, pumpers, and hand crews provide the initial attack. Hand crews, bulldozers, and various types of water-handling equipment are used to finish the job. The average fire season runs from June 10 - October 15. Approximately 10 percent of the fire season days are considered to be to be extremely high risk for fires. Fire risk is determined by fuel and weather conditions.

Wildfire Control Factors. Prevention is the strongest fire fighting method available to the Forest Service. Slash is a major by-product of timber harvest. Since many fires are started from slash, the use of slash for home heating and wood chips helps to remove the danger of forest fires. Accessability to areas of slash is a factor in the amount that is available to the public.

Human Environment

Socioeconomic Overview

The Mt. Hood National Forest is not only a part of the region's natural environment. It is also a part of its social and economic world. People who live in the region use the Forest for work and for play. The interests of these citizens have a special impact on the management of the Forest.

Forest planning focuses on resource-related issues, and assesses the environmental, social, and economic impacts of alternative management choices. To do this, the effected components of the environment must be identified. This section of Chapter III describes the social and economic environment which is affected by management of the Mt. Hood National Forest.

The Mt. Hood National Forest covers parts of Multnomah, Clackamas, Hood River, Wasco, Jefferson and Marion Counties (see Map III-15). The Forest's boundaries encompass land on the west and east slopes of the Cascade Range. Mt. Hood, which is Oregon's tallest mountain and one of its best known landmarks, is also on the Forest. Most of the Forest is within a two-hour drive from the Portland metropolitan area.

Zone of Influence

The primary zone of influence is the geographic area where the social, economic, and/or environmental condition is significantly affected by changes in Forest resource production or management. As is shown in Map III-15, the primary zone of influence extends well beyond the boundaries of the Forest. The Mt. Hood National Forest has two zones of influence. The primary zone of influence includes all or portions of Multnomah, Washington, Yamhill, Clackamas, Hood River, and Wasco Counties. A secondary zone of influence, also shown on Map III-15, includes those areas where people may have some concern for the Forest, but do not use it or depend on it to the extent of the people in the primary zone of influence. The information provided in this section will focus on the primary zone of influence.

This influence is felt in many ways. Several thousand people in the influence area depend directly on the Forest for employment. This includes workers in the wood products industry, the recreation industry, and Forest Service employees. Many thousand more people in the influence area work in industries which directly support these workers.

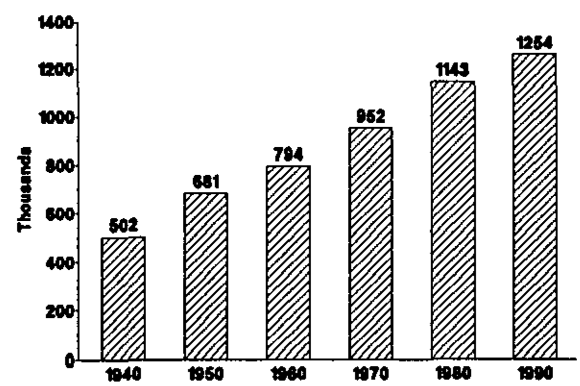
The Mount Hood National Forest is one of the most heavily used national forest for recreation in Washington and Oregon; more than 2 million people visit the forest each year. These visitors come from all over the world. These visitors participate in activities as diverse as sightseeing, windsurfing, downhill skiing, and berry picking.

The residents of the area are not aware of the many ways they are affected by the Forest. The City of Portland has some of the highest quality municipal water in the country because of the Bull Run Watershed. When Portlanders gaze at the beautiful silhouette of Mt. Hood on the skyline, they rarely think about the management activities, such as air quality and wilderness management, that make that view possible. In 1989, the Christmas tree in Portland's Pioneer Square was cut from the Mt. Hood National Forest.

Population

The population of the zone of influence has grown significantly over the last 50 years. Figure III-1 illustrates this trend.

Figure III-1 Portland Metro Area Population



(Source: Center for Population Research and Census, Portland State University)

This growth trend was interrupted during the recession of the early 1980's. Between 1980 and 1982 unemployment rates in the Portland area reached levels that have not been experienced since before World War II. This caused people to leave the area to search for jobs elsewhere (see Table III-23 for out-migration figures). The Portland area recovered from this recession more slowly than other parts of the country; it was not until about 1986 that Oregon was solidly in the throes of recovery. Since that time Oregon has experienced a healthy rate of in-migration and population growth.

An influential component of these new immigrants to Oregon has been largely well-educated, affluent people from urban areas. These so-called "equity emigrees" have come particularly from northern and southern California. They often come to Oregon seeking a clean, less crowded environment and lower housing costs. (This has been particularly true for retirees; many can purchase homes in Oregon more cheaply than the selling price of their previous homes. This group has influenced management on the Mt. Hood primarily by lobbying for amenity value uses.

In the past ten years, the largest increases in population have been on the west side of the Forest, adjacent to Portland, and in suburban communities in Washington and Yamhill Counties. The Mt. Hood Corridor (consisting of the communities along highway 26) has also been a growth area. During the recession of the early 1980's Hood River and Wasco Counties lost population from out-migration. Most of Hood River County's loss was made up by growth in the city of Hood River. Hood River has been growing since it was "discovered" by wind-surfers. Hood River is also the home for many part-year residents and tourists. Wind surfing growth is expected to level off, but other forms of tourist development are expected to continue in Hood River (ERA, 1988). Wasco County continues to loose population as young people leave for jobs elsewhere and the population ages. The City of The Dalles has been the main growth area in Wasco County; growth has occurred through tourism and the diversification of manufacturing industries. Both Hood River and Wasco Counties have become more "urbanized" as growth has been concentrated almost exclusively in the urban centers.

Population in the six county area as a whole is expected to reach 1.4 million people by the year 2,000. The largest increases are anticipated to occur in the Portland metropolitan area, especially in the suburban areas of Washington and Clackamas Counties.

The population of the influence area is predominantly white (see Table III-22). Most of the minorities live in the City of Portland. The rate of minority use of the Mt. Hood National Forest is much lower than the rate of use by the white population. This has been attributed to several factors. Many minority group members do not have the leisure time and the economic resources needed to get to the forest. Some minority groups are more comfortable with the urban environment and thus feel uncomfortable in the Forest environment. The Mt. Hood National Forest is currently involved in projects with private organizations to try and increase minority use of the Forest (Schuler, 1989).

Table III-22 Population by Ethnicity, Six County Influence Area, 1980

County	White	Black	American Indian, Eskimo, Aleut	Asian and Pacific Islander	Spanish Origin (includes all)
Clackamas	235,687	768	1,225	2,376	3,624
Hood River	14,485	39	158	297	1,042
Multnomah	504,113	29,844	4,998	14,163	11,239
Wasco	20,676	65	617	114	486
Washington	233,622	1,091	1,087	5,138	6,419
Yamhill	53,083	136	424	396	1,831
City of Portland	316,993	27,734	3,526	10,636	7,807

(Source: US Bureau of the Census, 1980)

Table III-23 Influence Area Population, 1980 - 2000

County	1980	1988 (est.)	2000 (est.)	Percent Change 1980-1988	Natural Migration	Total
Clackamas	241,911	262,000	335,140	5.30	3.09	8.39
Hood River	15,835	16,500	19,688	6.83	-2.63	4.20
Multnomah	562,647	570,500	584,430	4.58	-3.18	1.40
Wasco	21,732	20,600	26,115	3.41	-8.61	-5.21
Washington	245,860	287,000	373,362	8.99	7.74	16.73
Yamhill	55,332	59,800	75,308	6.63	1.44	8.07
County Total	1,143,317	1,216,600	1,414,043			
State Total	2,633,156	2,741,000	3,000,000	5.49	-1.39	4.10

(Source: Center for Population Research and Census, Portland State University, 1989)

Economic Base

Figure III-2 displays the per capita income and the main employment sectors for each county within the primary zone of influence. Per capita income is higher in the more urbanized counties, although per capita income in all counties is below the national average of $15,967.

The economic base of an area is the industry or industries which provide the "economic lifeblood" of a community by providing significant numbers of jobs and money from outside the region. The Mt. Hood National Forest zone of influence has several distinct economic base areas.

The Portland Metropolitan Area

This area is a major northwest center for manufacturing, trade, and finance. The largest manufacturing firms make instruments and machinery, fabricate metals, and process food. Portland's status as a trade center derives from its location. It is a hub of ground and water transportation. As of 1987, almost 90,000 people work in retail and wholesale trades, and wood and paper products manufacturers in Multnomah County employ about 5,000 people (State of Oregon, 1987). As the Portland area economy has recovered from the recession, almost all the growth has been in non-manufacturing jobs. Over the next several years, nonmanufacturing jobs are expected to account for 85 percent of the new jobs in the metropolitan area. Most of these jobs will be in the service and trade sectors (Stone, 1989).

The most recent data places the population of Portland at 432,175 (PSU, 1989). The city grew rapidly through the 1970's, primarily due to the immigration of people that were attracted by the area's job opportunities and quality of life. Metropolitan communities have expanded with the population, and several outlying communities have bedroom populations of commuters who work in the central city. Income levels in the metropolitan area are higher than the state average.

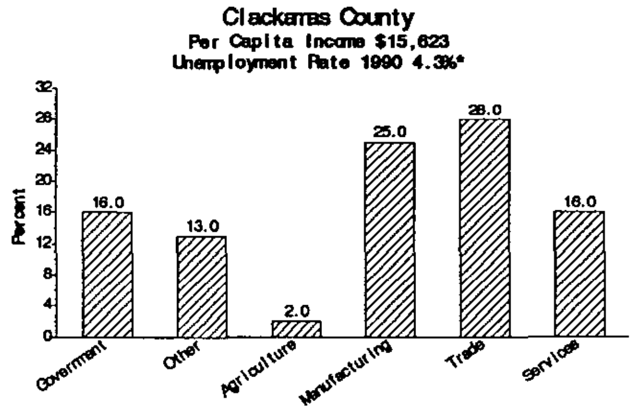
The proximity of the Mt. Hood National Forest to the Portland metropolitan area is unique, and has earned the Forest the distinction of being an "Urban Forest." Many Portland residents spend leisure time on the Forest, and have a special sense of ownership of Forest areas.

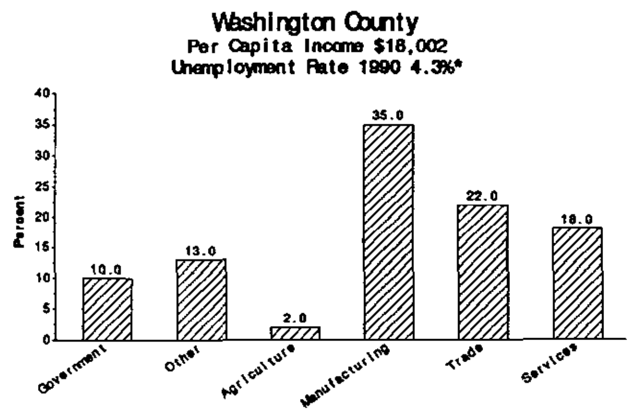
Clark County

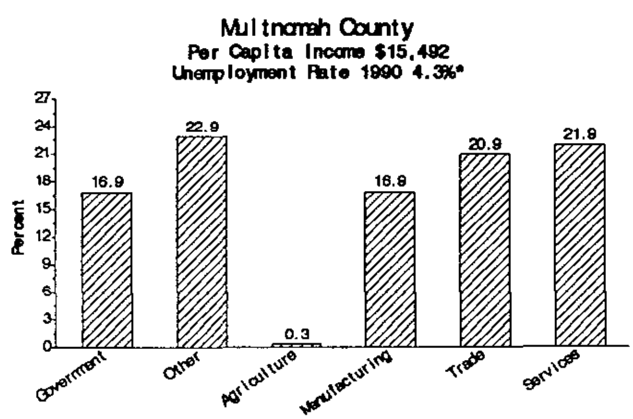
Vancouver is the economic center of the county; shipping, construction, and diversified light manufacturing are important industries. There is little log flow from the Mt. Hood National Forest to mills in Clark County. Most of the use of the Forest by Clark County residents is for recreation. Downhill skiing is particularly popular.

In terms of population and economic activity, Clark County and the City of Vancouver exist somewhat in the shadow of Portland. Much of Clark County is still rural.

Figure III-2 Influence Area Income and Employment

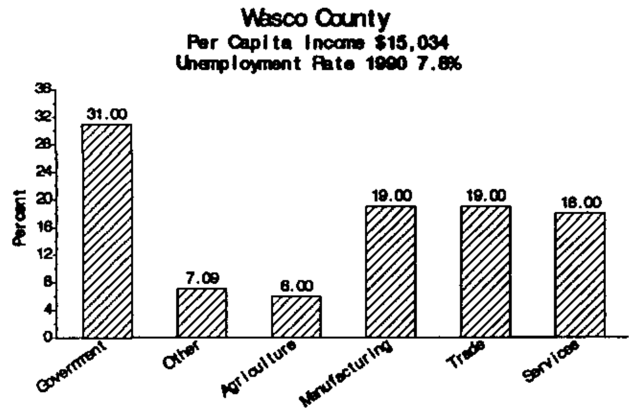


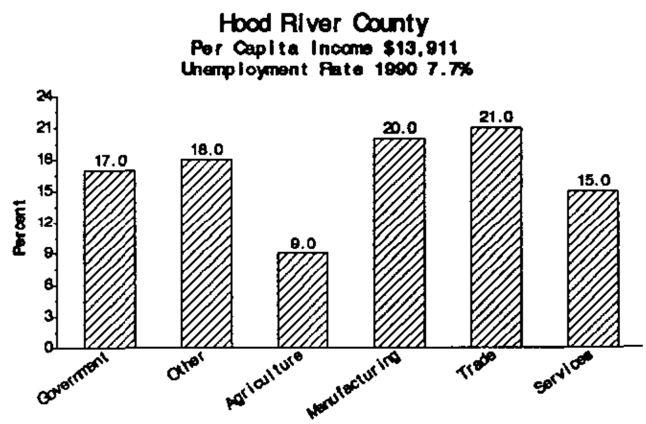


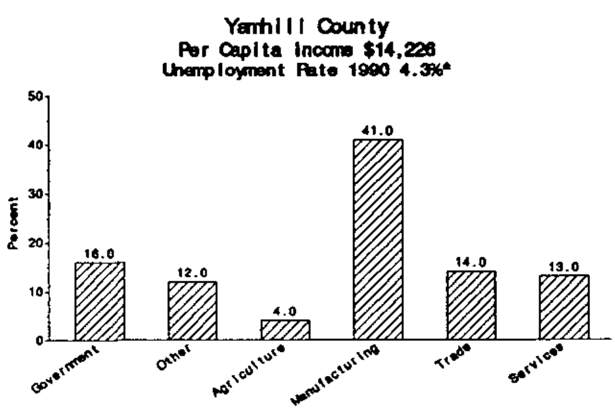


*Average for metropolitan area.

Figure III-2 Influence Area Income and Employment (cont)







*Average for metropolitan area.

Map III-15 Socioeconomic Influence Area

Portland area school children constructed nest boxes.

This has been changing in recent years, as Clark County has experienced steady population growth. Property taxes and housing costs are lower in Clark County than in the Oregon portion of the Portland metropolitan area. This, combined with the absence of income tax in Washington state, has attracted many people to live in Clark County. The 1989 (estimated) population of Vancouver is 44,450 and 220,400 for Clark County as a whole.

Washington County

In recent years Washington County has been the fastest growing county in the metropolitan area. The eastern portion of the county is largely suburban and relatively affluent. Many eastern county residents commute to work in Portland or work in one of the many corporate centers in Beaverton, Tigard, or Hillsboro. Most employment in this part of the county is in the service sectors, high technology, and light manufacturing. The central and western portions of the county remain mostly agricultural or forested. As growth continues in Washington County, some of these areas, especially along the Sunset Corridor (the area along Highway 26) will probably be converted to residential and commercial uses.

The primary Forest influence area includes the suburban areas in eastern Washington County. As is with Clark County, there is very little log flow from the Mt. Hood to mills in Washington County. Most of the direct use of the Forest by Washington County residents is for recreation. Some Washington County residents have indirect economic ties to the Forest because they work in industries which indirectly support timber industry employees and their families.

Yamhill County

Yamhill County is predominantly rural, but like Washington County, has changed character over the past decade. The primary Forest influence area covers the northeastern corner of Yamhill County between Newberg and Sherwood, primarily along Route 99W. As with Washington County, there is very little log flow from the Mt. Hood National Forest to mills in Yamhill County; most of the direct use of the Forest by county residents is for recreation.

Clackamas County

Clackamas County has a strong and diversified economy, especially in the more urbanized northwest part of the county. Smaller communities in eastern and southern parts of the county are still tied to resource-based employment. As of 1987, 25 percent of the County's employment was in manufacturing, including some 2,000 people manufacturing wood products. Roughly half of the County's labor force commutes to work in Portland. Major industrial areas include Wilsonville and Milwaukee; smaller manufacturing centers are located in Molalla, Boring, and Estacada.

Clackamas County is one of the fastest-growing counties in Oregon. Most of this growth is concentrated in western Clackamas County as described above. Outside of the metropolitan portion of Clackamas County, much of the economy is based in resource-dependent industries, particularly timber. The economic activity in communities such as Estacada and Molalla tends to be obscured by Clackamas County data. As economic growth and diversification in Clackamas County moves eastward, the economies in these communities may diversify.

Forest Service ranger stations in Estacada and at Ripplebrook are an important source of local employment, and are recognized for other social and economic contributions.

The growth of metropolitan Portland has had a major impact on some Clackamas County communities. Due to their location on the fringe of the metropolitan area, community populations have increased dramatically in recent years. Many of these areas' new residents want to combine rural lifestyles with urban amenities. A large number of people who live in Sandy and Estacada commute to Portland. Thus these areas are diversifying economically instead of continuing to rely on logging and wood processing.

Nature center.

Some families extend their incomes by fishing, hunting, and woodcutting on the Forest. The concern over timber-harvest levels is considerable on the west side. Many residents oppose non-timber designations of the Forest's land including Wilderness designations. However, this opposition is by no means universal in these communities.

The Mt. Hood Corridor

A collection of small communities, including Cherryville, Alder Creek, Brightwood, Zigzag, Wemme, Welches, Rhododendron, and Government Camp along Highway 26 in northeast Clackamas County, makes up this corridor. It numbers about 6,500 residents; half of these are seasonal.

The corridor was originally logging country, but employment shifted to service and recreation as private land was cut over. Most commercial activity at this time is along Highway 26 in a strip-development pattern. Ninety percent of the 100 commercial enterprises in the corridor employ less than six people (Povey, 1987). In contrast, three ski areas attracted more than 300,000 skier visits in 1984-85, and produced a substantial volume of commercial activity.

Corridor residents manifest considerable concern about the Forest's management activities. Many of them feel that clear cutting in the corridor will hurt their businesses, property values, scenic values, or damage water quality. The Forest Service sends timber sale plans to 20 organizations in the area to keep them informed. Problems associated with the interface of public and private lands must be expected to continue, as the population in the corridor expands.

Recreation residences on the Zigzag Ranger District provide a significant benefit to the community. There are 557 privately owned homes on 9 tracts on the district. The recreation residence area covers about 5,000 acres. Many of these homes are used all year, mostly on weekends. Residence fees provide an annual income of about $260,000 to the Treasury, 25 percent of which is returned to Clackamas County. In addition, residents pay utilities and purchase groceries and recreation equipment in communities in the Mt. Hood Corridor.

The Columbia Gorge: Cascade Locks, Bonneville, Bridal Veil

In spite of its proximity to the metropolitan area, and its status as a major transportation corridor, the Gorge remains essentially rural. Employment is mainly connected with wood products, maintenance of dams, and some highway service jobs. Some residents commute to work from the area. With the designation of the Gorge as a National Scenic Area, its residents have become very sensitive to the issue of federal versus local control.

Hood River County

The economy of Hood River County has traditionally had an agricultural base. A large number of jobs are in the processing of foods such as fruits and nuts. The food processing industry's employees are general unskilled and seasonal. The peak season is July when employment reaches about 5,000; most seasonal migrant workers are Hispanic.

Wood products employment is also significant in the county. In November 1989, 580 people in Hood River County were directly employed in the wood products industry.

Recently the importance of recreation to the economy has grown. Employment in recreation is primarily seasonal in this County. Two ski areas employ 350 people during peak season to serve the needs of an estimated 370,000

Aerial view of Columbia Gorge.

skiers per year. Additional employment in recreation includes service jobs related to sightseeing, hunting, fishing, and windsurfing.

The Hood River Ranger District generates a considerable amount of local employment. Over half of the County's total road budget comes from Forest Service payments in lieu of taxes. Residents and businesses, including agricultural businesses, depend on Forest-supplied water for domestic uses and irrigation. County residents also use the Forest for recreation and woodcutting.

Significant population growth has taken place in the upper Hood River Valley. Both new and old residents demonstrate pride in the scenic and rural character of the Valley. However, growth and development have generated controversy. This is especially true regarding second home and recreation development. While some people look upon the expandtion of recreational and commercial business as sources of desirable economic diversity, many others believe that such development threatens the quality of life in the area. Despite this growth, there is still considerable unemployment in Hood River County, especially in rural areas. Hood River county has been designated a "labor surplus area" by the U.S. Department of Labor because unemployment rates have been at least twenty percent above the national average for the past two years.

Wasco County

The industries that make up the economic base of Wasco County are agriculture, trade, wood products, and manufacturing. The Dalles dominates the County's population and economic activities. It is a center of trade in the Mid-Columbia region, with as many as 300 employees working in food processing industries during peak seasons. Aluminum production provides a significant number of jobs. The wood products industry employed about 360 people in November, 1989. The Columbia River provides hydroelectric power and access to shipping. The Port of The Dalles expects to see continued growth in the 1990's.

Agricultural products are a major County commodity. The main crops are grain and cherries, but livestock sales are also substantial. Gross farm sales in the County were $28.4 million in 1985. The economy of this County is essentially resources-based, with The Dalles area providing some diversification.

Rural residents look to the Forest for their community watersheds, log supplies, grazing, wood for heating, and recreation. Forest Service payments to Wasco County reached $1.6 million in 1984; the Forest Service is also a significant source of jobs in the Dufur and Pine Grove areas. The Dalles Watershed on the Forest is the primary source of drinking water for The Dalles, and for irrigation in rural Wasco County.

Changes have been relatively slow in Wasco County. Rural communities are growing to some extent, but they remain dependent on timber and agriculture as their employment base. Maupin is a local center of manufacturing, tourism, and trade. Tourist-oriented businesses are helped by the proximity of the Deschutes River. Tygh Valley, Wamic, and Pine Grove depend heavily on employment generated by forest products. The Friend area and Dufur are agricultural communities. Grazing on adjacent Forest land contributes to the economy. Wasco County has been designated a "labor surplus area" by the U.S. Department of Labor because unemployment rates have been at least twenty percent above the national average for the past two years.

People in rural Wasco County generally oppose rapid growth and feel strongly about independence and local control. County residents have expressed high interest in forest decisions which affect timber supplies, range resources, water, and employment.

Warm Springs Indian Reservation

With 640,000 acres located on the southeastern side of the Forest, this reservation operates as an economic, social, cultural, and governmental unit. The Confederated Tribes, governed by a Tribal Council, directs the use of commonly-owned lands and businesses such as mills and resorts. Members of the Tribes receive dividends from operating profits and can be leased land. Tribal government provides most governmental services, including education, health, social, fire protection, and law enforcement.

Population on the Reservation has grown significantly, primarily due to expanded tribal employment opportunities, improved health conditions and tribal initiatives to reduce out-migration. The periods of greatest growth were between 1950 and 1960, and during the last decade. Most of the population is located in or near the community of Warm Springs on Highway 26. The residential population is approximately 3,200.

The Reservation's economy is diversifying, as illustrated by the Tribes' hydropower plant on the Deschutes River. At the present time, about 60 percent of the Reservation consists of forested land, and its economic base rests upon wood products, hydropower, tourism, fishing, and agriculture.

The Reservation was created by treaty with the United States government in 1855. The treaty reserved traditional rights in accustomed use areas, including the Forest, for such activities as fishing, hunting, and food gathering. Traditional plants and anadromous fish, such as roots, huckleberries, and salmon, remain very important to tribal members.

The Reservation generates approximately $26.5 million in annual payrolls and 1450 jobs, which are important elements in the Central Oregon economy (Warm Springs Business and Economic Development Office).

The Forest has common concerns with the Tribes about anadromous fishery, wildlife management, transportation, fish and silvicultural practices. Communications between the Forest and the Confederated Tribes are dealt with on a government-to-government basis.

Forest Users

The ways in which people interact with or depend upon the Forest and its resources are many. "Users" of the Mt. Hood National Forest can roughly be categorized into four groups:

- People who depend on the Forest's resources to earn their livelihood. This group includes people such as loggers, mill workers, and resort owners and employees.
- People who use the Forest for recreation or other non-income producing pursuits: These include recreationists, such as hikers, anglers, skiers, nature watchers, and sightseers.
- Native Americans, who use the forest for cultural, religious, historical, and economic purposes.
- Long distance (amenity) consumers, who use the Forest's resources indirectly. This includes people in Portland who drink water from the Bull Run Watershed or people who use the timber the Forest produces.

Swimming is one of the many recreational uses of the Forest.

These groups could be affected in several ways by the way the Forest is managed. This is discussed in more detail in Chapters 2 and 4.

Returns to the Treasury

The Forest Service receives payments from timber harvest, grazing, recreation, and special use permits. The Forest Service is required to return 25 percent of its dollar receipts to the counties within the Forest boundary (this was instituted by The Twenty-five Percent Fund Act of 1908.) The amount of funds that an individual county receives is based on the percent of the Forest's land that lies within the county. The law requires that these funds be used to build and maintain schools and roads. These funds are important to rural communities. Detailed information on the portion of this money that could be credited to the different program areas was not readily available.

Table III-24 Payments to Counties from Mt. Hood National Forest Receipts, Fiscal Year 1980 - 1989 (in 1982 Dollars)

Year	Clack-amas	Hood River	Jefferson	Marion	Multnomah	Wasco	Annual Totals
1980	8,445,930	3,533,820	75,750	1,137,218	1,198,334	3,457,525	17,848,577
1981	6,118,542	2,553,829	54,875	823,843	868,237	2,504,758	12,924,084
1982	2,256,699	941,988	20,241	303,874	320,311	923,880	4,766,993
1983	3,445,562	1,438,262	30,904	463,960	489,056	1,410,593	7,278,337
1984	3,620,029	1,511,605	32,166	487,899	514,011	1,482,052	7,647,762
1985	3,066,940	1,255,811	26,720	405,289	427,451	1,231,114	6,413,325
1986	4,584,979	1,917,359	40,743	617,984	651,975	1,877,200	9,690,240
1987	4,421,625	1,850,295	39,291	595,967	637,051	1,811,672	9,355,901
1988	5,344,976	2,233,143	47,496	720,420	772,349	2,191,338	11,310,022
1989	4,806,318	2,002,936	42,709	647,817	698,499	1,987,669	10,185,948
Avg/County	4,611,160	1,923,905	41,090	620,427	657,727	1,887,780	

However, in Fiscal Year 1982, about 98 percent of these funds came from timber sale receipts; about 1 percent came from recreation; and about 1 percent came from grazing permits and other sources.

The Payment in Lieu of Taxes Act of 1976 requires the Forest Service to pay local governments based on both the acreage of Forest land within the local government jurisdiction and the population of the jurisdiction. Table III-24 displays the combined amount of these payments for the past several years.

Range Vegetation Management

The Mt. Hood National Forest has historically provided forage for domestic livestock. The primary objective has been to allow use by livestock, as other resources are maintained. Local ranchers utilized forest lands for Spring and Summer forage. This allowed them to produce crops on their home ranches. As a result, the local economies were supported by agricultural production.

One of the goals of the grazing program is to provide range for local ranch operations. A few of them depend on the Forest's Spring-Summer range. This dependency is the basis for the Forest's grazing permit system. The permit system is discussed in greater detail below.

Forest Overview

Lands that are considered to be suitable range have the following characteristics:

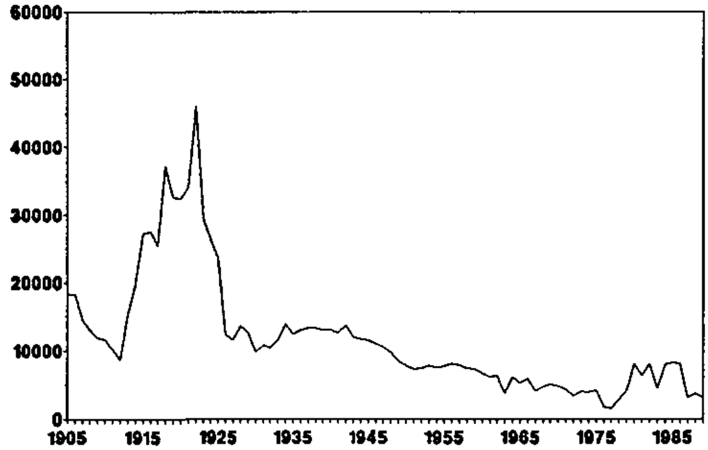
- It provides 50 lbs. or more of palatable forage per acre, per year, or is capable of this level of production.
- It can be grazed on a sustained yield basis.
- It is accessable to livestock, or can feasibly be made accessable.

Unsuitable range should not be grazed by livestock because of unstable soils, or other unsuitable conditions. Unsuitable range may have value for wildlife forage (Forest Service Handbook 2209.21, Chapter 200, Section 240, Range Suitable). Approximately 6,000 acres, which represents about .05% of the Forest's land, are considered suitable range.

Transitory range produces the majority of the forage utilized by livestock. on this Forest. Transitory range is created when timber harvests create openings that produce forage. This forage lasts for 10-25 years, or until the tree seedlings shade out the undergrowth. In 1983, the transitory range on the Forest was estimated at 76,000 acres.

The primary objective of the Forest's range program is to manage rangeland vegetation for domestic livestock grazing without causing unacceptable damage to soil, water, or wildlife habitat. Opportunities also exist to use livestock

Figure III-3 Livestock Use Trends (1905-1989)



as a tool in vegetation management. As an example, conifer plantations can be grazed with livestock under controlled conditions. This can reduce the amount of grasses and other non-woody plants which compete with tree seedlings. This type of complementary resource management is planned at the project level, rather than on a Forestwide level.

Current Conditions

Livestock grazing under the permit system begins as early as May 1, and continues as late as September 30. Livestock use is monitored in Animal Unit Months (AUMs) and is regulated through a permit system. There are about 5,300 term permitted AUMs annually on the Forest. An animal unit month (AUM) is the amount of forage a 1,000 pound cow would consume in one month. Forage consumption by other animals is converted to AUM's from animal months by the following factors:

- mature cow = 1.0 AUM
- mature sheep = .2 AUM
- one horse = 1.2 AUM's
- cow/calf = 1.32 AUM
- ewe/lamb = .3 AUM

Current Capacity

Current carrying capacity on the Mt. Hood is 9,628 AUMs. Our permitted livestock use is 5,300 AUMs. This represents only about half of the available carrying capacity. The main reason for these unused areas is that they are located on transitory range. The location of transitory range changes over time, according to timber harvesting practices. For a variety of reasons, it is not always feasible to graze these areas. This may be due to lack of water for livestock, problems achieving proper livestock distribution, etc.

AUMs

Westside grazing allotments are not used, due to transportation and predation problems.

Allotment planning emphasizes stocking within the carrying capacity of the land, and range use patterns.

Permit System

Term permits are the most stable type of permit, and are generally issued for a ten-year period. Livestock operators must meet certain requirements to qualify for term permits. In 1988, the Mt. Hood National Forest had 710 cattle grazing under term permits, for a total of 2,790 AUM's of actual use.

Temporary permits are issued for up to one year, and have few requirements for permit qualification. In 1988, 10 cattle were covered by temporary permits, for a total of 35 AUM's.

Private land permits are issued to those permittees owning or controlling private lands within Forest boundaries. By administering these free permits, the Forest service assumes management responsibility for livestock use on the private lands. These lands are managed as an integral part of the grazing allotment. In 1987, the one private land permit in effect was cancelled due to change of ownership.

Grazing Fees

Grazing fees on National Forest System lands in the 16 western states are calculated through the formula prescribed in Executive Order (EO) No. 12548 of February 14, 1986. This fee formula is, in most respects, the formula established in Public Rangelands Improvement Act of 1978 (PRIA). The Executive Order modified the PRIA formula by establishing a minimum level of $1.35 per AUM. For fee purposes, the Forest Service has used Animal Months (AM's) as the pricing unit rather than AUM's (see glossary of the EIS). The Animal Month formula allows for adjustment of fees, based on livestock prices and production costs during a given year.

Fencing

Permittees are responsible for maintaining approximately 125 miles of fence on the Forest. National Forest permittees must also maintain all other structural range developments built for proper livestock management. These include stock ponds, spring, troughs, guzzlers, corrals, and trails.

Allotment Management

There are 9 grazing allotments located on the Forest (Map III-16). Six of these are used by 10 livestock owners (permittees). Some allotments have two permittees grazing on them, while others have only one. The allotments range in number of animals permitted from 25 to 600 head of livestock, with an average of 122 head.

We will continue to administer 6 allotments on the Forest. Grasshopper, Badger, Long Prairie, White River, Wapinitia and Clackamas Lake will be managed according to the terms of existing allotment management plans.

Areas which will be dropped from allotment status are Horsetail, Roaring River and High Rocks. Term grazing permits will no longer be issued for these allotments. However, they can be grazed to accomplish other resource management objectives, such as weed control or the enhancement of desireable vegetation. These allotments have been grazed for several years, and were vacant as 1989. Horsetail will be dropped from allotment status due to it's small area and minimal forage production. It also has high recreational and scenic values, as well as important riparian and wildlife habitat. Several of these recreational and riparian areas have been fenced to exclude livestock. This adds increased responsibility to the permittee for fence maintenance,and makes the allotment less economical for livestock grazing.

Cattle grazing in pasture.

The Roaring River and High Rocks allotments are mostly transitory range which has grown back to a forested plant community. These allotments have also been vacant for several years. They will be dropped from allotment status, due to unsuitable grazing condition and low demand from livestock operators.

The permanent range areas on the Forest are presently rated in fair to good condition, with an upward trend. Permanent range comprises a small portion of the total range resource and Forest acreage. For this reason, maintenance of it's condition is not a major management problem. Condition and trend ratings do not apply to transitory range, because the forage quality of transitory range varies with timber management practices.

Map III-16 Range Allotments

Problems occur when utilization exceeds the desired level of use for specific areas. This is particularly true during late summer when upland vegetation dries out. At this time, water becomes fairly scarce and livestock prefer to concentrate along the green belts of riparian areas.

Table III-25 Range Allotment Management Levels

Allotment	Management Level
Badger	C
Clackamas Lake	C
Grasshopper	C
High Rocks	B
Horsetail	C
Long Prairie	C
Roaring River	A
Wapinitia	C
White River	C

A - No livestock grazing.

B - Livestock use managed within current grazing capacity, with minimum range improvements.

C - Livestock managed to achieve full utilization of allocated forage.

D - Livestock managed to optimize forage production and utilization.

Resource Inventory Needs

Range vegetation information was collected for most of the Forest in the 1950's and 1960's. The range standard used at that time have been updated. In order to serve as a basis for management decisions, this data must be updated or reinventoried for use with current management standards. To accomplish this, the following information will be gathered for each allotment:

- suitability of the land for grazing
- existing vegetative cover types
- potential vegetative communities
- condition of vegetation
- soil stability
- forage production and utilization
- structural improvements

Site-specific data will be included in the allotment management plans (AMP's). They are located at the Ranger District offices and the Forest Supervisor's office and, are available for public review.

Range allotment planning is prioritized based on the vegetative condition and management concerns associated with the allotment. Condition of riparian areas are of special concern in these planning processes. Revision of range databases is an integral part of allotment planning, and helps to assure the accuracy of the plans.

Production and utilization studies will be the primary means of determining allotment carrying capacity. All allotment management plans will comply with the management direction in the Forest Plan.

Demand Trends and Supply Levels

Demand for grazing use differs between the east and west sides of the Forest, Demand on the west side is low and the allotments have been unused for several years. Demand on the east side is higher than what can be accommodated under current management direction. Although requests for additional grazing permits (primarily for cattle) are received each year, the small amount of forest land in the permanent range vegetation type limits the amount of additional livestock that can be accommodated. Forage is available on transitory range created by timber harvest. However, additional riding, salting, water developments, and fencing would be necessary to improve distribution of livestock and prevent overuse of riparian areas.

Permittees must normally share in the costs of range improvements to their allotments. Limited funding, for both permittees and the Forest, has limited the use of this transitory forage. The forage on these transitory ranges will remain unused until the necessary improvements have been installed and optimum grazing systems have been implemented.

However, the need also exists to maintain grazing range in satisfactory condition and to meet the minimum requirements for other resources such as wildlife, soil, and water quality. Present and future demand will continue to outpace the Forest's ability to improve it's livestock capacity.

Significant Resource Interactions

Given a choice, livestock tend to concentrate in the riparian zones associated with streams and wetlands. Cattle prefer riparian areas because most of their daily requirements, such as succulent feed, water, shade, and moderate temperatures are met in a relatively small area.

If too many animals gather along streams over too long a time, they overgraze the vegetative cover and compact the soil. Such overgrazing increases bank erosion, and leads to reduced water quality. As riparian vegetation disappears, the lack of streamside shading can increase water temperatures. These conditions reduce the quality and quantity of both aquatic and streamside wildlife habitats. The presence of livestock in recreation settings can also affect the character of these settings.

In some cases, the need to rehabilitate overused riparian areas on the Forest may require temporary exclusion of livestock from the affected areas. However, most riparian management objectives can be met by adjusting the season and/or intensity of livestock use.

The simultaneous production of forage for wildlife and livestock is also of concern. Most of the Forest's mule deer winter range is also managed for livestock grazing. More information is needed to determine the relative amounts of forage that should be provided for livestock and for wildlife. Although the Forest Plan will dictate overall management for deer winter range, resolution of specific conflicts will be accomplished through individual allotment management plans.

Timber management activities can provide opportunities to improve the distribution and production of livestock. Timber harvest creates openings which function as transitory range. Until the replanted tree seedlings shade out the undergrowth (10-25 years), this temporary range produces the majority of livestock forage on the Forest. Transitory range also makes it possible to redistribute livestock away from traditional concentration areas (such as riparian lands) onto sites that have received little or no livestock use. Timber harvest operations and post-sale activities can disrupt planned pasture rotations, damage range improvements, and restrict proper livestock distribution for short periods.

The increased use of transitory forage is desirable in these timber harvest areas. The physiological needs of forage species, as well as specific site objectives, should be considered when utilization levels in the allotment management plans are set.

Timber Production

The National Forest timber management program responds to two interactive elements: demand and supply. The use of wood for many products creates demand for timber harvest. This demand creates an expectation that National Forests should supply their share of timber, as well as other forest products.

Timber supply depends upon the Forests' ability to grow trees of the desired size and species, and on the land area they can allocate for this purpose.

This section explains how demand and supply factors in timber management on the Mt. Hood are related to national, regional, and local trends. There are differences between the DEIS and the FEIS (final) version of this section. The major difference is that demand is now outpacing supply, and many new environmental factors are being considered.

Demand

A large amount of research has been devoted to the projection of demands for wood products. Many factors have been identified. Some of them are:

- Population growth
- Economic growth
- Processing technology
- Substitute products
- Competition from imports
- Competition from other regions
- Environmental concerns
- Consumer purchase patterns
- Interest rates
- Energy prices
- Changes in export markets for logs and lumber
- Recycling Economy

Softwood dimension lumber, which is one of the most important products of Forest timber harvest, is strongly tied to the number of housing starts. Housing starts are sensitive to mortgage rates.

National Demand Perspective. The Forest and Rangeland Renewable Resources Planning Act (RPA) requires a periodic assessment of the demand for timber and other resources. A 1984 assessment projected continued growth in timber demand.

We have recently seen bids of nearly $1,200/MBF for Douglas-fir, but these prices could easily be misinterpreted. They do not necessarily indicate a skyrocketing long-term trend, or a cyclical recurrence of boomtown economy. It is more likely that these high prices are an oddity caused by short-term market conditions. It is also probable that the demand for timber is accelerating over the long term.

The latest RPA Assessment (USDA, 1989) concluded that demands for all of the major timber products would increase over the next five decades, and the total demand for softwoods would increase 35 percent.

National short-term demand for lumber is still strong, but seems to be slowly declining. Consumption in 1989 was over 47 billion board feet, down from 1988 levels, which were in turn down 6% from 1987 levels (Roberts, 1989).

Overall world demand for lumber, however, will reach an all-time high, according to Roberts.

Sustained demand will depend primarily on continued high rates of personal income, and on the affordability of housing and mortgage money. Some additional factors include: the lack of materials that can be substituted for lumber, the controls on supplies of lumber, and the levels of supply from National Forests.

The ability to sustain the projected regional increases on a long term basis is linked to the critical issue of costs, and to the ability of producers to lower costs to be competitive with wood substitutes (Schallau 1986).

The forest planning process is flexible, and can deal with an uncertain marketplace. Changes can be accommodated as they arise, and revisions in assessed demand will be reflected in amendments to the Forest Plan.

Regional demand perspective. A number of challenges face the Pacific Northwest from the perspective of timber demand. Recent trends suggest that the demand for regionally-produced timber is moderately increasing, as compared to the slowdown that occurred in the early 1980's.

Structure replacement, repair and remodeling will equal the needs of new housing. Demand for high strength structural wood products is expected to expand. Cautious projections for restrained increases in demand seem to be outdated (Nomura, 1981). Over the next decade, the amount of timber demanded from the Pacific Northwest will probably grow faster than in the previous decade.

The Pacific Northwest could increase exports by developing a flexible, regional basis for stabilizing wood supplies. This would involve changes in the current market system, and would provide more products in the form demanded (Campbell, et al, 1983). Modernization of facilities, state-of-the-art technology, cost reduction, and diversification into other areas of production could help to rebuild and stabilize the wood-based sectors of the region (Schallau 1985).

State of Oregon. Oregon State University examined the future role of public forest lands in the State's economy, as part of an overall estimate of the State's ability to produce timber (Beuter and others, 1976). This research determined whether current statewide harvest levels could be maintained, and whether the state's proportional share of national timber supply could be maintained if national demand increased.

The research concluded that the State could maintain increased harvest levels if the amount of timber supplied by the National Forests in Oregon is increased. National Forests' contribution to the stability of the wood products industry has stimulated interest in timber management.

The average annual harvest of timber in Oregon during the 1977 to 1986 period was 7.3 billion board feet. The National Forests provided about 39% of the total (Oregon State Board of Forestry, 1989). The annual harvest rose 13% to almost 8.3 billion board feet in the five year period ending 1988 (Oregon Timber Harvest Report, 1988).

The "Forestry Program for Oregon" (FPFO) report is periodically updated and published by the Oregon State Board of Forestry. It is a statement of the demand for timber from the State perspective The Mt. Hood National Forest has worked with the Board to examine the FPFO statewide objectives, and apply specific objectives to the Mt. Hood National Forest. Chapter II of the FEIS includes a discussion of the relationship between this demand, and the supply of timber provided by various alternatives.

Mt. Hood National Forest. Timber harvest targets were assigned to the National Forests based on the RPA Assessment of the National demand. The Forest's share of national production was set at 376 million board feet per year through the year 2030 in the 1980 RPA program. Harvest in 1989 was 312 MMBF. Until 1989, sell levels remained above 320 MMBF.

At the local level, the demand for timber that is directed to a single producer, such as a forest, is affected by the local alternative sources of supply. These supplies may come from other forests or agencies, or from private lands. At the individual forest level, timber buyers require a reliable supply in order to make reasonable business decisions.

Timber harvest activity.

A Sustained high interest in bidding for the Forest's timber reflects continuing demand, in spite of the uncertain long term forecasts. Low log prices have occasionally made the harvest of purchased timber unprofitable. For example, in FY 1985 a total of 1,500 MMBF of sold timber remained uncut, but by January 31, 1990 less than 255 MMBF of this timber remained (Report R06TSA-93).

Supply

National Trends. The main source of projections used to develop long-range plans and programs for the management of the National Forests is the Forest and Rangeland Renewable Resources Planning Act (RPA) 1989 Assessment and draft 1990 Program Update. These projections focus on the long-term (50 year) supply of timber, do not necessarily incorporate short-term fluctuations within the various regions. Projected RPA trends for timber supplies include the following summary for softwood timber:

The national projected total of softwood roundwood harvest would rise 35% from 11.7 billion cubic feet in 1986 to 15.8 billion cubic feet in 2040 (USDA Forest Service, 1989). The outlook is for increased softwood harvests nationally, but there are important differences among the major softwood timber producing regions.

In the Douglas-fir subregion, the harvest was 2.6 billion cubic feet in 1976, and rose to about 3.1 billion cubic feet in 1986. The annual harvest is expected to decline to about 2.5 billion cubic feet in the year 2000, and slowly increase to 3.0 billion cubic feet by 2040 (USDA Forest Service, 1990).

The South presents a contrast as the other major source of softwood timber harvest. Its harvest is projected to rise from about 5.1 billion cubic feet in 1986, to 7.9 billion by 2040.

The South should be able to show an increase in harvest because of its remaining inventory, and by some substitution of hardwoods. However, a recent unexplained decline in the growth rates in the South complicate this picture. This may indicate that the South could be shift to a slower rate of increase, until the year 2040. Much of the current Southern expansion of softwoods and hardwoods has occurred because wood products production has become more diversified, in comparison with other regions of the country.

Canada is now supplying a portion of timber that formerly came form the Pacific Northwest. Canadian Timber sources are expected to drop 30-50% over the next 10-15 years.

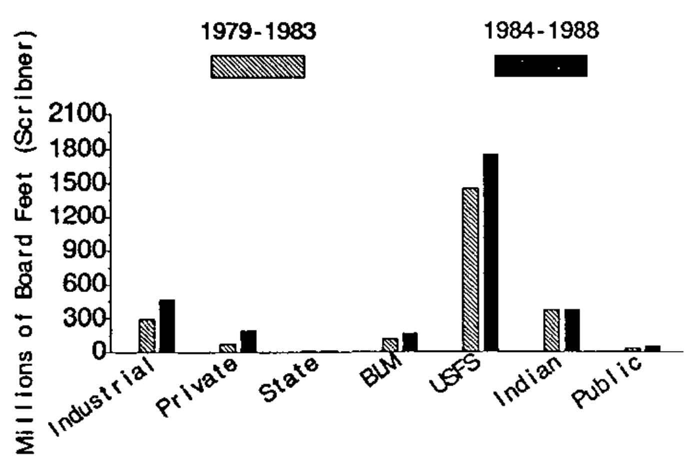
The overall timber supply levels in the Pacific Northwest may be able to meet future demand, but there are problems in the market areas within the region. Problems may include the shifting of the industry, a shift in the emphasis for the types of wood products produced, and the ability of the area to supply the specific types of wood products that are needed.

Private/Public Land Interrelationships. At about the same time a drop in the out-of-region supply capability begins to take place, the growth of wood fiber on private lands in the Pacific Northwest could again be reaching the capability to supply major quantities of softwoods.

There has been a trend of accelerated timber harvest in private timberlands, which makes it difficult to predict the production capability of private lands in the next few decades. Public forests will be looked upon as a relatively stable, major source of wood fiber.

The Mt. Hood Harvest Area produced over 5 billion board feet in the ten year period from 1979 to 1988. This period spanned vastly different market situations. The first half of the period was marked by high inflation and a steady demand for a vast store of timber under contract. High prices were paid. This supply was partially returned to the pool through the Federal Timber Contract Payment Modification Act of 1985. Figure III-4 shows the total timber harvest, by owner, for the Mt. Hood National Forest harvest area.

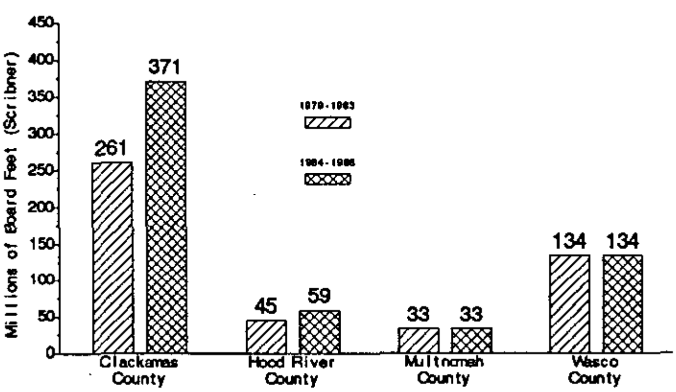
Figure III-4 Average Annual Harvest by Landowner



The second half of the period, from 1984 to 1988, was marked by an active economy with a steadily rising demand for timber. Much of the timber involved in the buy out program was returned to the market in this period.

Figures III-4 and III-5 show the amount of timber removed from the Mt. Hood Harvest Area by various land owners. Marion and Jefferson counties fall within the overall Forest influence area, but are not considered in these graphs because of the Forest's minimal economic interaction with them.

Figure III-5 Average Annual Harvest by County



Source: Oregon State Board of Forestry-Forestry Program for Oregon, 1989

The increases in timber harvest shown the preceding graphs are a departure from projections of change in future timber harvests in the North Willamette Valley Timbershed. Timber For Oregon's Tomorrow, also known as the "Beuter Report", was developed by Oregon State University. (Beuter et al, 1976). It predicted that timber harvest in this timbershed would decline 30 percent by the third decade. The 1989 update of this report confirms the earlier estimate, and shows a predicted change of -25% to -30%.

The Warm Springs Indian Reservation may be capable of increasing their timber production (Warm Springs Reservation Comprehensive Plan, Confederated Tribes of the Warm Spring Reservation, 1984). Their comprehensive land management plan indicates the Reservation has a substantial amount of standing timber volume in the portions of the McQuinn Strip within Wasco County (Confederated Tribes of the Warm Springs Reservation, 1984). An area of 79,000 acres located between the 1871 and 1887 survey lines of the west boundary of the Warm Springs Indian Reservation that has reverted to Tribal ownership as a result of 1971 laws. The Comprehensive Plan specifies that the timber produced from the McQuinn Strip will be processed in the Tribal-owned mill in Jefferson County, which is outside of the Forest's Influence Area.

Mt. Hood National Forest Timber Supply. The ability of the Forest to provide timber is limited by a number of factors. The most important are:

- The amount of area on which timber can be managed.
- The amount of standing timber.
- The rate of growth for newly regenerated timber stands.
- The amount of wood volume reserved for the benefit of wildlife, watershed, soils, fisheries, visual quality, and other non-timber values.

Approximately 60% of the Forest's total lands are suitable for timber production. The unsuitable acres were screened out through a detailed analysis. A summary of the screening results is provided in the accompanying table. For additional information, see Appendix B, and a paper entitled "Determination of Land Not Suitable for Timber Production," Mt. Hood N.F., 1984, 1989.

The 678,442 acre total considered to be tentatively suitable, and was the basis for the development of all alternatives except the No Change alternative (NC). The NC alternative is based on the 753,000 acres that are potentially suitable for timber management plan.

Table III-27 Lands Tentatively Suitable for Timber Production[1]

	Not Suited for Timber Production	Totals
Total National Forest Area		
Other Ownership	39,365	1,102,815
Net National Forest		1,051,999
Screen 1: Non-Forest		
Water	18,175	
Not stocked with 10% tree cover	76,358	
Lands developed for other than timber production purposes	20,000	
Total Screen 1	114,533	
Forested Lands Net		948,917
Screen 2: withdrawn from timber production		
Wilderness Areas	160,800	
Research Natural Areas	1,719	
Wild Rivers	6,319	
Special Interest Areas	59	
Total Screen 2	168,897	
Net after withdrawals		780,020
Screen 3: Irreversible resource damage	20,880	
Screen 4: Regeneration difficulty	80,698	
Lands Not Suitable for Timber Production		
Total Screen 1 through 4	385,008	
Lands Tentatively Suitable for Timber Production		678,442

[1] *For detailed calculations, see Suitability Process Paper: Determination of Land Not Suitable for Timber Production on the Mt. Hood National Forest (Mt. Hood National Forest, 1989).*

Figures III-6 and III-7 shows the area that is screened out of the total land base that is suitable for timber production. Wilderness represents the largest portion.

Figure III-6 Lands Unsuitable for Timber Production

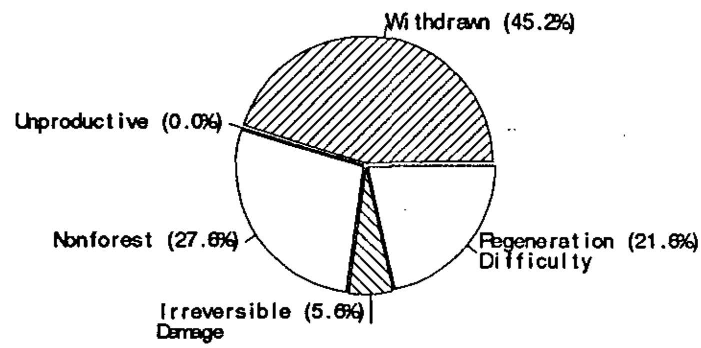


Figure III-7 Acres of Land Unsuitable for Timber Production

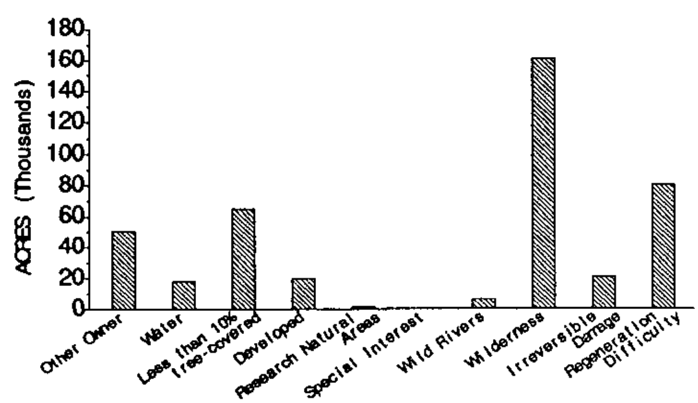


Table III-28 Timber Volumes by Working Groups

Working Group	Cubic Feet
Grand fir	524,796
Mountain hemlock	280,839
Silver fir	242,626
Western hemlock	1,677,003
Separate suitability component	3,705
Total	2,728,969

Updated data in the analysis considers the changes in the land base, inventory, and productivity that occurred after the present allowable cut levels were established.

If all tentatively suitable acres were managed for maximum timber yield, the highest timber volume sustainable over time would be 68.5 MMCF/year (420 MMBF/year, first decade ASQ). This level of production is less than the potential production of 383 MMBF stated in the current Timber Management Plan. The Forest could continue to offer the present volume for sale over a short period of time because it has enough mature remaining standing timber available to cut.

Only chargeable timber harvest can be planned with certainty (see glossary for a definition of "chargeable harvest"). Additional commercially valuable timber may be available in the future, but specific amounts cannot be assured. Nonchargeable volume might include, the salvage of dead trees, or timber removed from lands that have designated as not suitable for regular harvest because of other resource needs. Nonchargeable volume has been estimated by comparing the alternatives in Chapter II. Total timber volume (Timber Sale Program Quantity or TSPQ) is the sum of chargeable and nonchargeable volume.

The annual amount of timber that is actually cut differs from the amount of timber sold each year. Figure III-8 below depicts the difference between the amount of timber sold each year between 1977 and 1986, and the amount of timber actually cut during this period.

Figure III-8 Timber Cut and Sold (1977-1989), Mt. Hood National Forest

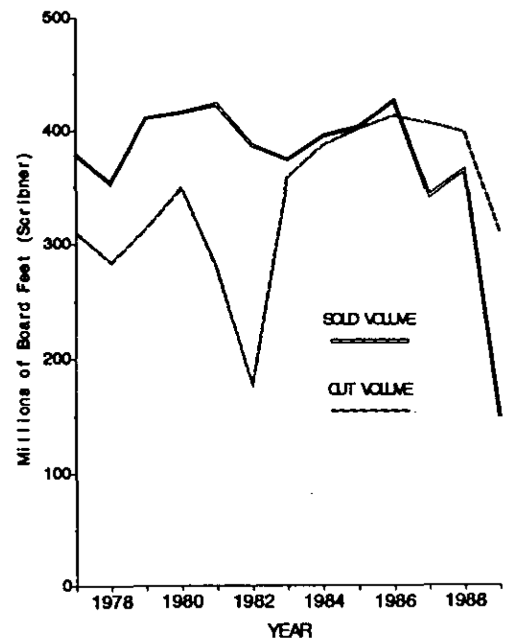


Table III-29 Annual Timber Production, Mt. Hood National Forest

Year	Chargeable	Non-chargeable	Total
1988	268.1	62.8	330.9
1987	289.6	42.8	332.4
1986	343.8	56.1	399.9
1985	293.0	99.3	392.3
1984	318.9	72.1	391.0
1983	309.1	60.5	369.6
1982	267.0	50.9	317.9
1981	307.5	58.5	366.0
1980	327.7	62.4	390.1
1979	332.5	63.3	395.8
Average	305.7	62.8	368.6

In the 1970s, industry did not cut all of the timber it purchased primarily because the available timber supply exceeded demand. An economic recession and high interest rates may have influenced this situation. The trend has reversed in the 1980's. For the last five years, the amount of timber harvested has exceeded the amount that has been sold.

Relationship to the Natural Environment

Harvest of the Forest's timber resources may affect the natural environment more than any other activity. This is a summary of these effects. See Chapter IV for more detail.

The roads needed to harvest timber require a long time to return to a natural appearing condition. They can be restored to productive status if needed, or can be closed to reduce the effects on wildlife and water quality.

Some animals, such as deer and elk, can benefit from clearcutting. Populations of other species depend on a certain amount of mature timber or old-growth habitat.

Deer and elk require specific relationships between the amount of cover provided by stands of mature timber, and the amount of forage available in natural and created openings.

Timber harvest is a valuable tool for achieving this balance. The design of individual timber sales, as well as the Forest Plan, incorporates the balancing of needs for many wildlife species.

Slash left by precommercial thinning causes problems for deer and elk when they travel through plantations. Access to forage becomes inhibited by the residual woody material. However, thinning can be helpful to small mammals and birds that use the slash for cover. The wildlife section includes more detail about balance and interactions between timber and wildlife.

Soil compacted by timber harvesting can lead to accelerated water runoff. This can result in damage to riparian resources. Our harvest practices are designed to avoid compaction, where possible.

Weeds are disseminated along roads, and sometimes spread into harvested areas. Weeds crowd out desirable forage plants.

The ecological relationships of forest resources can be affected by fire. Some kinds of vegetation are renewed by wildfire. Fire may also damage trees that are valuable for lumber. Logging slash may sometimes be burned to reduce fire hazards, or to regenerate desirable species for timber.

Any ground-disturbing activity, such as timber harvesting operations, can damage the environment of sensitive plants. However, most species of sensitive plants grow in nonforested areas, such as meadows, wet sites, bogs, talus slopes, dry cliffs, grasslands, dry alpine sites, pumice areas, and rocky sites. Since timber harvests are unlikely in these areas, the impact of timber management on sensitive plants is minimal.

Relationship to Human Environment

Communities. Many mills in small communities within the Forest's Influence Area rely on the Forest for much of their supply of timber. (Section 4 of Appendix B provides additional information.)

Young mill worker at Broughton Mill.

A million board feet of timber requires about six logging/sawmill workers to manufacture it into lumber or other products. These workers hold jobs that are called "direct employment", in their relationship to the timber industry. These workers depend on powersaw mechanics, diesel mechanics, and other workers that are considered to be the indirectly related workforce. Drug store clerks, hardware store owners, and school teachers are needed to serve the workers in direct and indirect positions. These positions are called "induced" employment.

Timber harvest is a form of primary manufacturing, and is an important contributor to national economy. Timber harvest directly affects local taxpayers because part of the timber receipts are forwarded the counties that have boundaries within the National Forest.

More than ninety percent of the National Forest payments to counties comes from timber sale receipts. The law provides this payment because counties cannot collect taxes on National Forest land, but must provide services to these areas.

The amount of money that counties receive from the harvest of National Forest timber can be quite substantial. The amount that each county receives is proportional to the land area that each county contributes to the total acreage of the Mt. Hood National Forest. As example, almost half of the Mt. Hood National Forest is contained within Clackamas County. This allows Clackamas County to receive nearly half of the Forest's timber receipts that are paid to counties. Table III-30 shows the percent of Mt. Hood National Forest receipts that go to each county.

Sandy School, circa 1920s.

Table III-30 Percent of Receipts Paid to Each County

County	Percent
Clackamas	48
Hood River	20
Wasco	20
Multnomah	7
Marion	6
Jefferson	< 1

In 1989, these counties received over $10,000,000 from National Forest timber harvest (expressed in 1982 dollars. This is shown in Table III-31.

Table III-31 Payments Received by County From Mt. Hood 1989 Timber Receipts (1982 $)

County	Payment
Clackamas	4,806,318
Hood River	2,002,936
Wasco	1,987,669
Multnomah	698,499
Marion	647,817
Jefferson	42,709
Total	10,185,948

Firewood. Many people living near the Forest use firewood. The local demand for firewood increased from 2,800 fuel-wood gathering permits in 1975, to 13,100 in 1984. This demand may be stabilizing. The data shown in Table III-32 and Table III-33 are inconclusive.

Table III-32 Number of Firewood Permits, Mt. Hood National Forest

Year	Number of Permits
1987	7,006
1988	4,249
1989	5,692

Table III-33 Homes Heated and Number of Homes Heated Only With Wood (Source 1980 Census)

County	Total Heated Units	Wood Heat Only	Percent
Clackamas	84,698	9,701	11.45
Wasco	8,212	962	11.71
Multnomah	233,135	6,980	2.99
Hood River	332,007	18,699	5.63
Totals	332,007	18,699	5.63
State	991,593	123,789	12.48

These figures include only the homes heated primarily with wood, without another heating system as a backup.

The current supply of firewood comes primarily from slash/residue left from logging mature and old-growth stands. As older stands are harvested, this firewood source will diminish. Other sources may have to be explored if the present rate of demand continues.

The current policy provides firewood in many ways. The Forest could:

- Make low value green material like lodgepole and alder available.
- Do limited precommercial thinning of pole-sized green material.
- Issue contracts to move wood from sites that are inaccessible to the average woodcutter, to locations that are more accessable to woodcutters.
- Set aside areas for firewood cutting where the quality or species of trees are unacceptable for sawlog production.

If firewood demand increases beyond recent peak levels, the establishment of areas used exclusively for firewood production may be seriously considered.

Other Human Factors. The Forest Plan allocates some suitable timber production lands to uses that reduce the amount of timber yield. These management areas focus on our need for recreation, scenic quality, Wilderness, Research Natural Areas, and environmental quality concerns.

An effect of these management areas is the reduction of the timber supply for the market.

The supply of timber for each management area is estimated in the FORPLAN model. The modeling assumptions that are applied will reduce timber yields by controlling the entry rate of timber harvest, or by extending the rotation ages.

The roads that are used by Forest visitors, as well as other roads, are usually built with funds derived from timber sales. The transportation section of this chapter contains additional discussion about roads.

Management Concerns

Existing Commitments. The Forest is committed to the long-term sustained yield of forest products, and to the protection of other resources. In many locations, the harvest methods have been limited to the techniques that have the least impact on the Forest environment. Concern for the sensitivity of other Forest resources (such as wildlife, archaeological sites, etc.) have prevented timber harvest in areas with suitable timber.

Table III-34 Timber Sales Costs and Receipts (Millions of Dollars)

Year	Gross[1] Receipts	Timber Sales Program[2]	Reforestation TSI	Brush[3] Disposal	Other Resource support	Roads[4]	Total Costs
1985	29.1	4.1	.6	2.3	.8	4.3	2.4
1986	45.9	3.2	.9	2.4	.8	3.3	4.3
1987	45.4	4.3	.8	2.2	1.1	5.3	3.3
1988	56.5	3.9	.9	2.8	.7	4.4	4.4
1989	53.0	4.6	.9	3.1	1.0	4.7	3.7

[1] *Figures include all collections for K-V, BD, purchaser credit, etc.*

[2] *Figures include silvicultural exams, timber preparation, and timber sale administration.*

[3] *Figures include the Forest Service portion of the brush disposal (BD) work based on BD collection.*

[4] *Figures include road design, construction, reconstruction, and maintenance from both appropriations and purchaser credit.*

Below-Cost Timber Sales

In recent years annual receipts from Mt. Hood National Forest timber sales have been approximately 3 times larger than timber sale program costs. Table III-33 shows these receipts and costs. Most of the timber sold on the Mt. Hood National Forest has a relatively high value and is fairly easily accessed through the existing road system. This results in very little timber being sold at less than cost.

Typical situations in which timber might be sold below cost would be salvage situations or small scale tree removal, such as at a campground.

Minerals and Energy Resources

Background

Laws and regulations govern the exploration and development of all minerals owned by the United States Federal Government. The types of minerals which may be available include those which are:

- Locatable (e.g. gold, silver)
- Leasable (e.g. geothermal)
- Saleable (e.g. common variety minerals such as sand and gravel)

Locatable minerals include all deposits on public domain lands that are subject to disposal under the General Mining Law of 1872, and any amendments of the law. Locatable minerals include any solid, naturally occuring, inorganic substance in the crust of the earth, excluding salable minerals and leasable minerals.

The Mining Act of 1872 granted the right of the public to explore, stake, develop, and patent a mining claim on land in the public domain. When a mining claim is patented under this law, the patent conveys mineral and surface rights to the claimant. The Bureau of Land Management is the agency responsible for issuing a patent, if the patent applicant satisfies the statutory requirements.

The Mt. Hood Mining Act of May 11, 1934 (48 Stat. 773) amended the 1872 Mining Act as it relates to patent rights on the Forest. Under this amendment, all patents issued under mining laws which affect lands on the Forest convey only the mineral title. The purpose of this law is to retain the Forest's valuable surface resources under Federal ownership, and to allow them to be administered by the Forest Service.

Leasable minerals include the minerals that are excluded from the 1872 Mining Law through the Mineral Leasing Act of 1920, or from the Mineral Leasing Act for Acquired Lands (August 7, 1947). Leasable minerals include coal, oil, natural gas, phosphate, sodium, potassium, oil shale, sulfur (in Louisiana and New Mexico), and geothermal steam.

The Mineral Leasing Act of 1920, as amended, authorizes the Secretary of Interior to issue leases and permits on National Forest lands. The Forest Service now reviews mineral lease applications. It allows lease permit stipulations to be made that protect surface resources and prevent conflicts with other users and resource programs. The Geothermal Steam Act of 1970 (30 U.S.C. 1001-1025) established requirements for leasing geothermal resources on National Forest System Lands. The Mineral Leasing Act for Acquired Lands established requirements for leasing all types of minerals on acquired lands. The leases must be subject to the consent of, and conditions prescribed by, the Secretary of Agriculture.

Saleable (or common variety) minerals are nonmetallic and have widespread occurrence. Examples include the common varieties of sand, gravel, pumice, clay, pumicite, petrified wood, and various types of building stone.

Surface protection recommendations provided by Federal Regulations 36 CFR, 228 subpart C, establish the policy and standards for disposal of saleable (common variety) minerals. The Materials Act of 1947 (30 U.S.C. 601 et. seq.) generally requires competitive bidding for the purchase and use of saleable (common variety) materials on public domain lands. A Free Use Permit may be issued to a nonprofit organization, or to another government agency for this type of material.

At this time 556,800.00 acres of the Forest have been withdrawn from coverage by the 1872 Mining Law for locatable mineral entry, the Mineral Leasing Act of 1920, and the Mineral Leasing Act for acquired lands (Aug 7,1947). A total of 684,150.00 acres remain available for Locatable and Leasable Mineral entry. Not all of the available acres have potential for mineral development, nor are all acres with mineral potential actually available for development. Energy resources on the Forest include leasable minerals. They are geothermal resources, oil and gas, and hydroelectric sites, as requested by the Federal Energy Regulatory Commission. Hydroelectric development is described at the end of this section.

Existing Situation

Locatable Minerals

The exploration and development of locatable minerals has been limited on the Forest. The U.S. Geological Survey has identified the following three "Mining Districts" on or near the Forest's boundaries:

- The North Fork of the Oak Grove District (Cheney Creek District).
- The Zigzag (Laurel Hill) District
- The North Santiam District

One thousand acres on the Oak Grove Fork Mining District have moderate potential for mineral occurrence. The other areas on the Forest have low or unknown mineral potential. The main prospects are gold, silver, copper and cinnabar. The exploration and staking of claims for locatable minerals, particularly for mercury in the Oak Grove Fork District, are expected to continue. Development of mineral claims is not anticipated. Mining operations of locatable minerals should be small and intermittent. Map III-17 shows the quarries on the Forest.

Leasable Minerals

Geothermal Resources. In 1975, the U.S. Geological Survey identified three "Known Geothermal Resource Areas" (KGRAs) on the Forest. The geology of these areas, and competitive interest in nearby discoveries, indicate that there is a high potential for extracting geothermal steam. KGRAs on the Forest occupy 17,920 acres.

Table III-35 Known Geothermal Resource Areas (KGRAs) on Forest

KGRA	Location	Acres
Mt. Hood	Summit of Mt. Hood	8,960
Carey (Austin) Hot Springs	Adjacent to Clackamas River	7,680
Breitenbush	Southern Portion of Clackamas District	1,280
Total KGRA Acres		17,920

Through 1985, 127 noncompetitive geothermal lease applications had been filed. These applications include 292,177 acres outside of KGRA's. No new applications have been filed since that time. In April, 1984, the Bureau of Land Management opened the Cary (Austin) Hot Springs and the Breitenbush KGRA to competitive bidding. No bids have been recorded.

The Oregon Department of Geology and Minerals, the U.S. Geological Survey, the U.S. Department of Energy, private firms, and a number of private individuals have conducted geothermal exploration since 1976. Most geothermal explorations have been on the northern part of the Forest. The investigations conducted through 1980 resulted in a geothermal assessment of the Forest, which was published by the U.S. Geological Survey. Recently, interest in exploration has increased in the southern part of the Forest. These efforts are mainly concentrated in the Clackamas Ranger District. None of the companies or individuals that are conducting geothermal explorations have indicated the location of significant geothermal resources on the Forest, at this time.

A total of 17,900 acres within KGRAs have been classified as high in their mineral potential. Areas classified as moderate in mineral potential amount to 261,800 acres. Areas totalling 821,000 acres are rated low in potential. Approximately 8,960 acres in the Mt. Hood Wilderness have been classified as high in geothermal potential, but are not available to leasing or exploration. This area was withdrawn from mineral exploration by the Oregon Wilderness Act, 1984.

Map III-17 Rock Quarries

Oil and Gas Resources. There are 54,866 acres under oil and gas leases on the Forest. Applications for additional other leases have been filed, but were later withdrawn. State and private groups continue to review Cascade Range Geology for oil and gas potential. Areas totalling 340,200 acres which have had oil and gas lease applications, or leases, have been classified as moderate in potential. The remaining 760,500 acres of the Forest have been classified as low in potential. No prospecting permits for exploratory oil and gas drilling have been issued.

The 54,866 acres under oil and gas leases must be drilled within 10 years, or the leases will expire. The areas under lease and lease application are unlikely to be drilled. The leases will be discontinued unless exploration near the Forest proves that the areas have worthwhile oil and gas potentials.

Saleable or Common Variety Mineral/Rock Resources

Rock is the common variety mineral with the greatest Forest production. The basic need for rock is in the construction and maintenance of the Forest's roads. Rock is a limited, non-renewable resource, and material suitable for road construction is in short supply in certain parts of the Forest. There is a total of 162 quarries (Map III-17). 147 of these are developed and 15 are undeveloped. An undetermined potential for rock exists in 170 additional sites. 182 quarries have been closed due to economics, management direction, or depletion of rock.

In 1979, the Forest published a Rock Resource Plan, (updated in 1987), to provide the authority to use rock, and to guide the planning and development of this resource. It initiated a study to evaluate the current situation and demand for rock over the following two decades. The study found that many areas of the Forest have less rock than is needed to fully manage the Forest's other resources. It also concluded that the shortage would soon affect various areas. These figures are based on the known quantities of rock from existing quarries, and assume that the locations of new quarries, standards of road building would not substantially change. The study predicted that the Forest will be able to meet 38% to 86% of the rock demand. The 1979 demand predictions did not include the potential for rock that is procured outside of the Forest.

The demand for rock by Forest users peaked in the late seventies and has declined in the past four to five years. The demand for non-Forest rock use is sporadic. The average demand over the next decade is expected to equal the average use over the previous ten years.

The uneven distribution of rock on the Forest is an important concern. Transportation and labor costs increase when rock resources are not available in the vicinity that they are needed. Projects can also be delayed. A long term concern is that rock is a non-renewable resource. As the Forest's inventory is depleted, other sources will have to be located.

Small Hydroelectric Development

The first hydroelectric project on the Forest was the Three Lynx project on the Oak Grove Fork and Clackamas River completed in 1923. In March 1979, the city of Portland received a license for a powerplant for its Bull Run waterworks. These two plants, and a third, have a total rated capacity of 86.6 megawatts (MWs). An additional 0.012 MW site is under construction. Four sites with a rated capacity of 39.2 MWs are being considered for development.

There are 31 proposed hydroelectric sites on the Forest. They are rated at 142.6 MWs. Thirteen additional proposed sites are not located on the Forest, but are on streams flowing from Forest lands. Plants on these sites would be concern because they could affect fish, and fish habitats, in streams located on the Forest. Most of the proposed sites are in the Clackamas and Hood River drainages.

The Federal Energy Regulatory Commission (FERC) issues licenses to applicants that want to develop small hydroelectric sites. If FERC determines the development will not cause environmental damage, it issues an exemption from full license procedures. Under exemptions, the Forest and the Oregon Department of Fish and Wildlife can require conditions for the development of the site. Licenses are granted by FERC for sites that require particular stipulations. The Forest can propose stipulations to FERC which must be included in the license requirements. Since 1984, FERC activity on the Forest has mainly been involved with five or six sites where permittees are seriously trying to develop hydroelectric power.

From about 1980 through 1983, developers of small hydroelectric facilities increasingly sought out sites for power development, and put in claims for them. This period was marked by a sense of urgency for improving the nation's energy position, and other circumstances were at work to create an unusual demand for more hydroelectic development. The driving force of this increased interest appears to have been the Public Utility Regulatory Policy Act (PURPA),which was enacted in November of 1978. After 1983, the rush to claim new hydroelectric sites declined. The Pacific Northwest now has an energy surplus, and the Northwest Power Planning Council estimates the surplus will continue in the region through the early 1990's. Small hydroelectric facilities, according to the Council, will make small contributions toward the region's total energy needs of the future.

Table III-36 Quarry Locations on Forest

Number	Quarry Name	Quarry Number	Total Yards as of 1990
Barlow Ranger District			
17	Skyline	S11131H	100,000
21	Joe's Point	S21104L	474,300
26	Owl	S21126R	500,000
27	Jordan	S31101C	190,000
30	Stockton	S41104F	400,000
31	Bonnie Crossing	S41206B	500,000
36	Forest Creek	S41021Q	75,000
Bear Springs Ranger District			
33	Frying Pan	S40826D	200,000
34	Jackey	S40928D	140,000
35	Green Lake	S40924L	90,000
45	Rimrock	S51008E	100,000
46	Marine	S51133H	72,850
51	Stone Creek	S60811N	244,500
58	Warm Springs	S70802J	200,000
Clackamas Ranger District			
42	Boneyard	S50627F	17,250
43	Cripple Creek	S50624K	64,200
44	Sink	S50716G	24,800
47	Lower Mitchell	S50731G	50,000
48	Thunder	S50726R	72,000
50	K II	S60709G	57,000
54	Linerunner	S60625Q	169,600
55	Devils Ridge	S60819Q	112,000
57	Lowe Creek	S70709Q	168,400
61	Happy	S70719N	105,000
62	Wall	S70819E	46,750
64	Squirrel	S80807M	104,000
65	Si-Olallie	S80814Q	100,000
66	Cachebox	S80729Q	10,000
67	Hawk Mt.	S80726F	485,600
68	Queen	S80725H	33,500
69	Boundary	S80731N	10,000
Columbia Gorge Ranger District			
2	Basin	N10619M	146,000
3	Talapus	N10720E	150,000
7	Porter's Point	S10610K	75,000
8	Windy	S10711J	239,100
10	Southside	S10621E	100,000
11	Chitwood	S10819J	98,720
18	Hiyu	S10833Q	48,900
19	Goodfellow	S20707A	91,750
Estacada Ranger District			
28	South Eagle	S30631M	189,936
32	North Fork	S40619J	58,800
37	DK	S50423E	15,000
38	OZ-Aircraft	S50518A	130,000
39	Southfork Mtn.	S50530D	150,000
40	Helion	S50515K	94,200
41	Whale Head	S50524R	133,800
49	Rhyolite	S60618J	25,000
52	Foggy Mtn.	S60536F	88,500
53	Trout Creek	S60631D	57,000
56	Red Rock	S70512N	87,800
59	Hughs Horse	S70534E	130,000
60	Lily Pad	S70629M	35,800
63	Hugh Creek	S80505J	45,000
Hood River Ranger District			
1	Defiance	N20929H	24,000
4	Raker Point	N10833L	249,500
5	Kiyi	S11002F	160,000
6	Jones Creek	S108 + 02NSW	5,000
9	Marco	S108 + 13H	200,000
12	Tower	S10824BSE	13,500
13	Dollar	S10920F	500,000
14	Coho	S10921S	150,000
15	Clear Creek	S10928F	40,000
16	Shellrock	S11027G	200,000
20	Cooper Spur	S21007E	10,000
25	Robinhood	S31005K	146,000
ZigZag Zag Ranger District			
22	Wildcat	S30621A	92,225
23	Laurel Hill	S30816P	199,850
24	White River	S30916L	515,000
29	Mud Creek	S408 + 02K	500,000

Transportation System

Background

Forest roads and highways play a vital role in providing access for people using the Forest, and in moving the Forest's products. Roads are also essential to the administration and protection of the Forest.

The rugged Cascade Mountains, are a natural barrier to east-west travel, and strongly influenced the development of transportation in the Forest's history. As the region became more populated, natural travel routes such as rivers, ridgelines, and the Columbia Gorge were used more heavily to move goods and services.

From the beginning of modern times, the Columbia Gorge has been the primary Northwest travel route for east-west movement. The Columbia River was the main carrier until the 1880's, when trails and rail lines augmented river travel. Construction of major roads began about 1915. Freeway reconstruction followed in the 1950's, and transmission lines and air routes completed the area's present system.

The Barlow Wagon Road and Trail was established South of Mt. Hood as a second major travel route. In 1845 the Barlow party followed Indian trails through the mountains, and those trails became an alternate route to the Willamette Valley. Although the route was improved, it remained rigorous to travel. Weary pioneers had to muster their last ounces of strength to complete this final leg of their journey to the West. The Barlow Road was a private toll road until 1915 when it was deeded to Oregon state. Four years later, in 1919, part of the route was improved for automobile uses. In 1924, the scenic highway loop around Mt. Hood was finished. The former Mt. Hood Highway is now U.S. Route 26. It is the most direct route from Portland to Mt. Hood and central Oregon.

With the exception of the Gorge and Mt. Hood highway routes, the transportation system on the Forest remained relatively primitive prior to the end of World War II. A road to Cloud Cap Inn was built in the 1880's for recreational purposes. A road to Lost Lake was completed early in this century. The Larch Mountain Highway was built as a scenic drive, and completed in 1939.

Most of the trails built by the Forest Service prior to World War II served as an extensive system for fire suppression and administration.

Trails called "truck trails" were also constructed. Many of them were built by the Civilian Conservation Corps. These trails established the primary network for the Forest's road system as it exists today. Major trails often were so well planned that they were later developed into modern roads.

As the area's timber on lower elevations of private lands was depleted, rail lines and logging roads were needed to reach the Forest's timber on the east side. The gentler topography and sparser vegetation on the east side made access comparatively easy. Some of the earliest logging roads and mills were established on the eastern boundary of the Forest in the 1890's. Between 1918 and 1935, logging railroads had penetrated to private and Forest lands in the West Fork of Hood River, and to the Badger/Jordan area. On the west side, Larch Mountain and Ladee Flat were also logged by rail.

By the 1930's, the Clackamas drainage and Bull Run Reserve were the only large sections of the Forest without roads. The opening of the Clackamas area began in 1923 when rail lines were constructed to the Oak Grove power plant. A truck trail soon followed. During World War II, an intensive effort was begun to harvest the valuable timber supplies in the Clackamas. When the war ended, road building financed by congressional appropriations and timber sales took place throughout the Forest, outside of the Bull Run. The Clackamas drainage become the focus of development during the period, due to it's highly valued timber.

A breakthrough occurred in the 1960's, when the Clackamas River road system was connected to the Breitenbush system on the Willamette National Forest. The link-up of two systems eliminated some timber-hauling problems, because it permitted hauling in two directions. It also allowed access to larger amounts of timber. Two additional roads were recently completed. The Lolo Pass Road was completed in 1952 as part of a powerline corridor project. The Bull Run roads opened in 1959.

Existing Situation

The Forest's 3884 miles of roaded transportation system may be classified in the following three catagories:

Type 1: 353 miles of road are classified as arterials. These main routes provide service to large areas and usually connect with public highways or other arterial roads on the Forest. These connections make up a network of primary travel routes. They are usually built and maintained for long-term management of land and resources with uninterrupted service. Their locations and construction standards are often determined by the need for maximum mobility and travel efficiency, and not by the needs of specific Forest resources.

Type 2: Collector roads total 1,168 miles, and were built to serve smaller land areas. They are usually connected to a Forest arterial or a public highway, and collect vehicles

Road detail.

from local roads or terminals. Collector roads are built and maintained for either uninterrupted or intermittent service. The level of service depends on the land-use and resource-management objectives of the area(s) served. Their locations and construction standards are determined by long term, multi-resource service requirements, in addition to travel efficiency.

Type 3: Local roads extend 2,363 miles. They connect terminals with the Forest's collector and arterial roads, and public highways. These roads may be developed and maintained for either long-term or short-term service. Their locations and standards of construction are determined by the need to serve a specific resource, activity, and not by travel efficiency.

Road standards for the three types of roads on the Forest vary from double-lane paved roads to primitive dirt roads with one lane. The total includes 1,334 miles that are suitable for passenger cars. 2,143 miles are limited to high-clearance vehicles, and another 408 miles are closed to all non-authorized traffic. Single-lane gravel-surfaced roads, with vehicle turnouts for safety, make up the largest part of the system.

Paved roads extend over 761 miles, including approximately 159 miles of paved roads in the Bull Run Management Unit. All 294 miles of road in this management unit have use restrictions. The roads within the Bull Run drainage are all closed to public use. Other roads on the Forest may be closed either temporarily or permanently for safety reasons, or to protect resources.

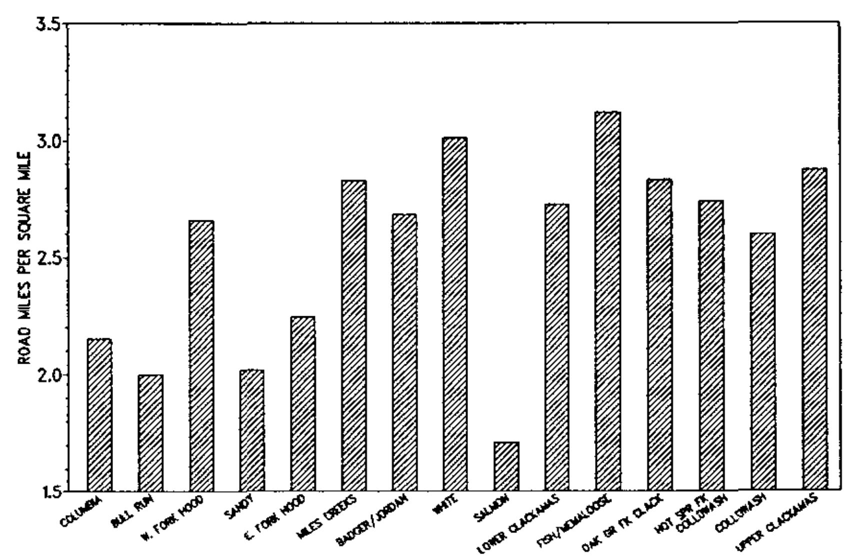
Arterial and collector roads are essentially completed, although many sections of the roadway are inadequate for existing traffic These will require reconstruction. The major area of new construction will be in the local road system.

Road density compares the amount of roads in an area to the number of square miles they serve. The accompanying chart shows the existing road density for the developed portion of each major Forest drainage. The developed portions of roads are those out-side of the inventoried unroaded areas.

The major public highways associated with the Forest are:

- Interstate 84.
- State Highway 26.

Figure III-9 Road Density Within Major Watersheds



- State Highway 35.
- State Highways 224 and 216.

A total of 1.7 million vehicles use the Forest's transportation system every year. Most of these vehicles (about 1,300,000) are driven by visitors. Administration and protection activities by Forest Service employees account for 250,000 vehicle entries. Another 75,000 vehicle entries are associated with hauling 135,000 truckloads of logs per year.

Demands on the Forest and associated roads are projected to increase in response to a number of developments. Nearby population increases will increase the demand for fuelwood and recreation opportunities. This results in greater traffic, and heavier demands on public transportation systems.

Anticipated increases in traffic volume will require the design and construction of roads to insure adequate safety and environmental protection. Increases in road usage may require higher standards for transportation facilities than have been provided in past years. An alternative to higher standards would be to close more roads than in the past. Higher standards and road closures may produce higher costs and greater needs for resource specialists' interactions. The need for interdisciplinary planning and public participation may also increase.

The existing situation and potential growth impacts on Highway 26 were studied by the Oregon Department of Transportation, the Forest Service, and the Federal Highway Administration. The study found that the capacity of Highway 26 east of Rhododendron is being exceeded for periods of time every year. The Oregon Department of Transportation has evaluated several alternatives for increasing the capacity of Highway 26 between Brightwood and Rhododendron in a recently completed Environmental Impact Statement (USDA-Forest Service, 1986. See Bibliography.)

The Forest has 41 temporary bridges. Studies show that 21 need replacement or major rehabilitation by 1995,and 10 more will need replacement by year 2000. There are 71 permanent bridges. Five of these will need replacement or

Bridge.

major rehabilitation by 1995. Three additional bridges will need similar work by the year 2000.

The bridges inventoried include:

- Steel or concrete bridges more than 35 years old.
- Log bridges more than 15 years old.
- Treated timber bridges more than 25 years old.
- Bridges with load-bearing capacity significantly less than allowed under current laws or regulations.
- Bridges with significant damage, corrosion, or decay as found by inspections.

Relationship to the Natural Environment

Wilderness. The interaction between road construction and Wilderness is essentially limited to the land area along the fringe of the Wilderness. Road construction can improve access to Wilderness which is an important issue to many Wilderness users. Other Wilderness user feel that roads along the fringe of the Wilderness create noise, lights, and landscape modifications which may impair their wilderness experience.

Visual Resources. Road systems built for timber management affect most visual conditions. Travel routes, including trails, offer opportunities to view and experience Forest scenes. Roads that are highly visible may distract from the quality of the visitors' visual experience.. Factors such as steep slopes, contrasting soils colors, and minimal vegetative screening may contribute to this visual impact. Midslope locations are the most disruptive, but roads built along ridgetops and valley bottoms tend to retain scenic quality. Vegetative screening and reduction of road widths may also reduce the visual impact of roads.

Roads built in sensitive visual areas usually cost more to construct. Their slopes must be revegetated, and road profiles must be backfilled to reduce the visual contrast of the cut and fill slopes. The skillful location of future roads to trailheads, scenic points, ridgetops, and other locales can provide attractive vistas and expose scenic attractions. Roads can enhance visitors' visual experience on the Forest, rather detract from it.

Timber. The area required to construct roadways and associated slopes ranges from 3 to 9 acres per mile of road. Currently, Forest roads occupy about 20,400 acres which reduce the area available for timber production. The need for roads must be considered in virtually all phases of silviculture, including fire, pest, and disease control. Existing roads have generally been built in areas of large timber volumes where the values of timber harvest were high. Some forested areas have not been roaded because the stands are young or thinly stocked, values were low, or other resource values were considered to be more important.

Wildlife. The major impact of the Forest's roads on wildlife no longer comes from road building, but from the use of existing roads. The number of people interested in wildlife, both observing as observers and hunters, has increased. Seasonal road closures in some areas have become necessary to reduce the number of hunters these areas, and to improve the quality of the hunting experience. Seasonal closures have also been necessary to avoid the harassment of animals during the nesting, fawning, calving, and winter feeding periods. Elk spend less time in habitats near roads that are continually open to vehicles, according to a 1977 University of Idaho report. Roads with heavy traffic and cross-migration, or those near main travel routes for big game, will increase the likelihood of collisions. The Forest works closely with Oregon's Department of Fish and Wildlife to control the distribution of all hunters on the Forest.

Some species of wildlife, including birds, mammals, and reptiles, have benefitted from road construction. These animals inhabit the type of edge habitat created by the construction re-vegetation of cuts and fills.

Minerals and Energy. Road building and maintenance deplete common variety mineral resources, but provides access for mineral exploration, development, and production activities. Extended interest in geothermal energy could add strains to the existing road system due to increased exploration and production, but this burden does not appear to be a special problem at this time. Rock, however, is a non-renewable resource, and randomly distributed on the Forest. It's extraction may lead to future environmental problems. This situation is discussed in the section on mineral resources.

Water. Road density levels have an impact on water quality values. Roads increase the risk of water quality degradation, particularly during the first and second years following construction. The risk comes primarily from increased stream sedimentation. Sedimentation is caused by erosion of the road prism before it becomes stabilized or revegetated.

Sediment is not the only threat to water quality that is created by roads. Additional concerns include:

- An increase in the watershed drainage network and flow efficiency can cause higher water velocity in natural channels, and can possibly cause greater peak discharge.
- An increase in the surface area that is impervious to runoff increases water yields from those surfaces, and also disposes water more rapidly.

- The intercept of shallow, subsurface flows. Road cuts on steep slopes commonly intercept shallow, subsurface flows and sometimes intercept perennial flow zones. This immediately adds flow to surface drainage networks.
- An encroachment on stream channels and floodplains. By creating more efficient drainage networks and increasing stream power, roads tend to increase the risk of reduced water quality through accelerated bank and channel erosion, and the movement of erosion products including debris.

Soils. Although road building and maintenance are needed to develop and manage the Forest's lands, the activity can also have major impacts on the soil resource. Construction displaces large amounts of soil, exposes large areas of subsoil materials, and normally accelerates soil erosion. Some road maintenance work such as surface blading and ditch and culvert cleaning, can increase the rate of erosion for short periods.

Fisheries. The construction and maintenance of roads have various direct and indirect impacts on riparian-dependent resources including fish (USDA-Forest Service, 1980). Direct effects result from removing or modifying ground cover and riparian vegetation, physical modification of stream banks and stream channels, and modification of floodplain flood storage and routing characteristics. Where roads parallel streams for extended lengths, substantial areas of the riparian resource may be lost or negatively changed.

Road fills can modify flood storage and routing characteristics of floodplains, and can modify the character of streambanks and channels. When channels are straightened or narrowed, fish habitat areas are lost. Streambank cover, in-channel structure, and quiet-water habitats are often found on stream channel margins, or in small side and overflow channels.

Upstream fish passages can be blocked by road crossings of streams. A recent Forest Inventory of Road Crossings (1984) found at least 60 miles of anadromous habitat blocked, mainly by culverts. Since salmon and steelhead make extensive migrations to spawn, such restrictions can be deadly. In addition to road crossings, excessive water velocity, limited water depth, and excessive jump heights into the culverts create passage problems.

Indirect impacts of roads are numerous. They provide easy access to riparian areas for recreation or other uses. At the same time they also provide access for heavy equipment and materials needed for riparian area rehabilitation or enhancement. More than 70% of the Forest's developed recreation sites are within riparian areas. The location of these sites can lead to disturbances, harassment of fish, and poaching of anadromous fish. The harassment of spawning Spring Chinook and Coho salmon has been seen on Fish Creek, Still Creek, Salmon River, Clackamas River, and other habitats.

Unplanned dispersed recreation site development can occur due to vehicles driving into abandoned logging spurs or inadequately closed temporary roads. This sort of development often destroys riparian vegetation, accelerates sedimentation, and can even eliminate snags and large woody debris in the streams. Snags and woody debris are desirable in flowing water because they provide a diversity of micro-habitats for fish and aquatic organisms. Fish Creek is a stream with an all-season road running along much of it's length. A recent study (Everest et.al, 1984) found large woody debris to be about 20% of the amount expected for a similar stream flowing through a natural, old-growth forest. The study commented that significant reductions in favorable salmonid-rearing habitats probably took place in the stream. On the other hand, roads allow easier planting of hatchery-reared fish in streams, lakes, and reservoirs. Fish planting is an essential activity to support the heavy recreational angling in the Forest's rivers, lakes, streams, and reservoirs.

Roads indirectly cause a variety of impacts. Gibbons and Salo (1973) found that Forest roads are the main source of human-caused accelerated erosion. Accelerated erosion is well-known as a primary source of undesirable sedimentation and increased turbidity. These conditions degrade the quality of both spawning and rearing habitat for resident and anadromous fish. Excavation and sidecasting are major contributors to the exposure of mineral soils, the collection and routing of runoff, and reductions in slope stability. Road clearings can result in the loss of vegetative cover on streambanks. Cover loss can lead to increased water temperatures, reduce bank stability, and decrease hiding cover for fish. The use of Forest roads to transport chemicals, fuels or toxic materials will increase their risk of spillage. A chemical spill would cause a relatively large, but localized effect on the water quality of aquatic life. Chemicals used on Forest roads for dust abatement, road surfacing, or vegetation control can leach into water and reduce its quality.

Relationship to the Human Environment

Recreation Approximately 90% of total Forest recreation uses are closely tied to roads, according to 1983 Recreation Information Management estimates, Report No. 2300-1. Roads provide access to both existing and potentially developed recreation sites. Accessibility helps to determine the types of visitors, their types of transportation, and the kinds of recreation they experience. Road access allows activities such as camping, fishing, hunting, and wildlife observation. Additional activities include water sports, picnicking, car touring for pleasure and sight seeing, berry and mushroom gathering, and the cutting of Christmas trees and firewood. Road usage can be managed to attract or limit specialized vehicles such as high-clearance types, campers, or ORVs. The accommodation of recreational activities is a basic element of road design, construction, and maintenance. For example, road building into unroaded areas can expand dispersed roaded-recreation opportunities while it also reduces the activities of those who seek unroaded recreation.

Picnickers enjoy a scenic lunch.

Cultural Resources. Many routes used by the Forest's road system trace back to prehistoric travelways, prospectors' trails, sheep driveways, military roads, and wagon trails. The result is a considerable interaction between road development and cultural resources. Galm et al (1981) found that the location of a road, the characteristics of soils, and the volume of its use determines the intensity of such interactions. Road access may have increased vandalism at archaeological sites where previous access was limited to foot and pack animal. Data concerning the conditions of these sites prior to road building are not available, and the possibilities of vandalism cannot be verified. Vandalism of archaeological sites should be monitored in the future. Please refer to this chapter's Cultural Resources section for further information.

The main benefit of roads, with regard to cultural resources,is the access they provide to more remote areas. Improved access permits improved cultural-resource inventories, which will also benefit the public by providing access to sites selected for interpretation.

In some cases, road location and design have been modified for consideration of cultural resources. These adjustments have not added significantly to the costs of the road program.

The miscellaneous impacts of roads on the human community include firewood collection and range allocations. The Forest's road network is heavily used by people to remove firewood, poles, fence posts, and various other products. While range allocations are a minor use of the Forest's resources, permittees use roads to move livestock to and from various range locations and to manage their grazing operation. Forest personnel use roads to monitor forage and other range-related activities.

Management Concerns

Forest roads are constructed, operated, and maintained for the administration and protection of its lands. Section 8 of the National Forest Management Act states: "roads constructed on National Forest System Lands shall be designed to standards appropriate to their intended uses, considering safety, cost of transportation, and impacts on land and resources." This law implies that no single criteria for standards should outweigh the others. Therefore, a balance must be found for each section of road, as design standards are determined. The use, protection, and management of the Forest's resource objectives make up the criteria for road planning and maintenance.

It is sometimes necessary to close roads on the Forest, most often to meet land-management objectives. Such closures are authorized in CFR, Title 36, part 261. Specific reasons for closure include:

- protecting wildlife habitats
- maintaining water quality
- controlling erosion
- public safety
- conflicting uses
- reduction of maintenance costs
- legal mandates.

Timber-management activities served by the road network include planting, thinning, fertilization, seed collection, treatment of harvest residues, pest, fires, and diseases control, and other operations needed to conduct intensive timber-management programs. Since roads are needed to move logs from harvest areas to mills, a special management concern is the impact of log trucks, lowboys, yarders, loaders, service vehicles, etc., on the Forest's road-building standards and road conditions. Receipt from timber sales are a major factor to consider. These pay for virtually all new road construction on the Forest. The needed road density is determined by the location of the areas to be harvested, the slope of the ground, and the logging system.

Although timber management is a significant element in road planning, another element is the use of roads for recreational uses. To insure the safety of mixed traffic users, several precautions may by taken. Road maintenance levels may be revised or upgraded, timber or rock hauls may be re-timed re-routed, or roads may be reconstructed. Many roads, including Highway 26 to Mt. Hood and Highway 224 along the Clackamas River, were originally built to provide access to recreation. In other instances, roads may be closed to protect or enhance recreation opportunities, such as hunting, back-country hiking, or camping.

Recreation

Background

The Mt. Hood National Forest is one of eleven urban forests nationally. Its nearness to a growing urban population of over 1 million people, and the relatively easy and quick access, has made it the literal "backyard" of the Portland metro area and the Willamette Valley.

This spatial accessibility makes the Mt. Hood National Forest nearly the sole provider of many outdoor recreation opportunities, and the major provider of many others. It affords an irreplaceable ability to provide recreational facilities to all elements of the population, regardless of economic status, physical ability, ethnic background, or age. The Forest is seeking alternative methods of "linking" the urban environment with the forest environment by creating additional physical, cultural, and educational contacts.

The Mt. Hood National Forest offers a wide range of outdoor recreational experiences, activities, and recreation facilities. They include:

- More than 100 developed campgrounds, picnic sites, and other facilities, including Cloud Cap Inn, Multnomah Falls Lodge and Barlow Road.
- Six Wildernesses totalling approximately 186,200 acres. These include a portion of the Mt. Jefferson Wilderness, four Wilderness areas were established by the Oregon Wilderness Act of 1984.
- An extensive trail system concentrated in designated Scenic Areas and Wilderness that totals approximately 1,200 miles, and includes 111 miles of the Pacific Crest National Scenic Trail.
- Winter sports opportunities including downhill and cross-country skiing, snowmobiling and snowplay on 165 miles of designated snow trails and five ski resort areas, including Timberline Lodge.
- Pleasure driving, enhanced by scenic views and spectacular waterfalls, on more than 300 miles of paved Forest roads, including 3 scenic major highway loop drives and over 3,000 miles of other forest roads, such as the Columbia River Scenic Highway.
- Opportunities for hunting and fishing, including fishing for salmon and steelhead trout and native fish.
- Opportunities to cut firewood and Christmas trees.
- Opportunities to gather varied forest products, including berry picking and mushroom gathering.
- Opportunity to visit five Special Interest Areas that are set aside for public enjoyment of their recreational, scenic, botanical, and scientific qualities.
- Opportunity to visit five congressionally designated Wild and Scenic River systems.

One way to examine recreation opportunities on the Mt. Hood National Forest is to arrange the wide variety of attractions into Forest Themes. These themes can be described in terms of geographical differences and visitor use patterns. Map III-18 illustrates the recreation themes, and depicts the location of the major recreation sites the Forest.

Forest Themes

The Mt. Hood Loop - "A Potential National Scenic Byway"

The Mt. Hood Loop, as a composite attraction, is the most used feature on the Forest. It is the major physical "link" to the Portland metro area, and provides the many sightseers with their only opportunity to see a natural forest setting. The drive provides some of the most spectacular scenery in the Northwest,and is highlighted by the two most well-known and prominent landmarks in the State of Oregon: the Columbia River Gorge and Mt. Hood.

Scenic driving is the most popular form of outdoor recreation on the Mt. Hood National Forest. Part of "The Loop" - U.S. Highway 26 from ZigZag to the junction of Oregon State Highway 35, and Highway 35 to Parkdale - has been recommended to the Forest Service Pacific Northwest Region to be nominated as a National Forest Scenic Byway. Scenic Byways is a national program to recognize America's most beautiful highway drives. Scenic Byways identify the natural, cultural and historic features with interpretive signs and programs by providing pull-outs, rest areas, and short-loop hiking/walking trails.

The Loop is more than a scenic drive and is divided into three highway segments:

The Columbia River Gorge (Interstate Freeway 84/State Highway 30, Sandy River to Hood River). The waterfalls are one of the premier scenic attractions in the Gorge; Multnomah Falls Lodge is the most visited recreation attraction in the State of Oregon, according to "Driving Pleasure". More than two and a half million visitors arrive each year. This Lodge has been a popular visitor attraction since it was built by the City of Portland in 1926. In the late 1920s excursion trains carried visitors up the Gorge to visit the Lodge and falls. The City of Portland gave the Lodge to the Forest Service in 1943. The Lodge and its grounds have recently undergone extensive restoration and improvement. The Lodge is on the National Register of Historic Places.

Although it has traditionally been a major visitor contact point, Multnomah Falls has not been adequately staffed, maintained, developed or utilized to enhance and interpret the visitor experience in the Gorge.

Next to its waterfalls, the Gorge is best known and appreciated for its extensive network of hiking trails, and for the Columbia River Scenic Highway. This highway was considered to be an engineering marvel when it was constructed in 1915. Today, remaining segments of the old highway are popular with visitors who want to view the Gorge at a more leisurely pace than is possible on the interstate highway. In 1984, the scenic highway was designated a "National Historic Civil Engineering Landmark" through the efforts of the American Society of Civil Engineers.

The unique geological and cultural history of the Columbia Gorge provides a wealth of interpretive and visitor information opportunities. These sites include Wyeth Bench, Oneonta wetlands, the pioneer logging sites on Larch Mountain, and "Old Wagon Road" Historic Area.

The entire south shoreline of the Columbia River is largely undeveloped, and has been somewhat inaccessible since

Mt. Hood scenic corridor.

the construction of the Interstate 84 Highway. There are several water-based experience opportunities. The Warrendale Cannery/Kelly Pulp Mill site is suitable for fishing, picnicking, cultural resource interpretive displays, water play and perhaps some limited boat-in camping. Herman Lake near Cascade Locks has potential for development as a marina/boat launch and as a limited recreational vehicle campground and day use area. There is some potential to supply water play and board sailing opportunities at Wyeth.

The Columbia Gorge - internationally known for board sailing

Hood River Valley (State Highway 35, Hood River to the intersection of U.S. Highway 26). Since about 1984 Hood River and the mid-Columbia area has been recognized as a world-class destination for board sailing Use figures from the Hood River County Chamber of Commerce show a 68% increase in visitors between 1985 and 1988, and requests for information increased 416% during the same period. While much of this interest centered on board sailing, all the recent worldwide exposure has attracted other visitors to the area. Many of these visitors are seeking opportunities to hike, fish, mountain bike, ski or take tours of the vast orchards on the flanks of Mt. Hood.

The Cloud Cap/Tilly Jane Historic District, located at 6000 ft. on the northeast flank of Mt. Hood, is one of the highly visited areas on the Forest. Sitting on a rocky point is Cloud Cap Inn, a National Register Site. The Inn, designed by William H. Whidden and Ion Lewis, was constructed in the summer of 1889. During the same year, Chinese Labor built the first road access to the Inn, which was then the first resort on Mt. hood. In 1940, when a private group could not be found to operate the lodge, the Forest Service bought it in recognition of its historic importance. The Inn was placed on the National Register of Historic places in 1974.

Laurence Lake (Clear Branch Reservoir) is an area with tremendous potential. This is a relatively low elevation site that, despite limited facilities, already attracts a great number of users. A master plan for this site, and the Clear Branch drainage, is needed to protect fisheries and wildlife values while providing improved day use facilities, overnight camping, and hiking/biking and horse trails.

The Lost Lake Campground Master Plan ($3.5 million in improvements) is being implemented and this site will be expanded to accommodate recreational vehicles, provide barrier free access and improved boating facilities. When completed this site, already one of the most popular destinations on the Forest, will be one of best developed camping experiences on the Forest.

Camping along the East Fork of the Hood River has increased steadily during the past few years. Present full-service campground facilities at Robin Hood and Sherwood are often inadequate to meet demand, especially on summer weekends. Opportunities exist to convert Sherwood campground to a day-use picnic site, and to expand Robin Hood campground to meet present demand for camping.

Other potential viewpoints and/or day use picnic sites are planned at Lava Beds, Sahalie Falls, Tamanawas Falls, Surveyors Ridge and Klinger Springs.

Next to campgrounds, the extensive trail system has the most importance. Most existing trails are in good condition, and provide a variety of experiences and challenges. New trails could be constructed to provide opportunities for loop trips, and to accommodate the increased demand for trails that are suitable for mountain bike use, and horse use.

Parkdale Lava Beds is a unique geological feature which offers a variety of interpretive, picnicing, hiking, and camping opportunities. This area will be discussed further in the Special Interest Area section of this chapter.

With sport fishing continuing to grow in popularity, the Forest foresees an increase in public demand for quality fishing opportunities. Emphasis will be placed on providing a wide range of fishing experiences in both lakes and streams, including hike-in, drive to, and barrier free fishing opportunities.

Map III-18 Major Recreation Sites on the Forest

Highway 26 Corridor (U.S. Highway 26, Intersection of State Highway 35 to Zig Zag Ranger Station). The Highway 26 corridor, less than a hour's drive from Portland, is the first close-up glimpse of the Forest for many visitors. This first visit is usually part of a round-the-mountain drive, or a stop at Timberline Lodge before returning to Portland. These initial visitors are seeking help to orient themselves to the variety of things to see and do on "the mountain". Interpretive and visitor information services have the potential to reach thousands of first time visitors, as well as those repeat customers that are looking for some new experience.

Timberline Lodge and the Wy'East Day Lodge attract 1.2 million people each year, and are the second most visited attraction in Oregon. The Lodge was constructed at the 6,000 foot elevation on the south face of Mt. Hood during the 1930's, as a project for the Works Progress Administration (WPA). Over the years, the Lodge has become recognized as an outstanding attraction. Its location on the side of a mountain, its Cascadian architecture and its art work are unique. Artists hired by the WPA incorporated their work into the design and construction of the building. Wy'East, the new day lodge to accommodate skiers, was constructed in 1981 to save wear and tear on the original Lodge, to and help in the preservation of its special art. The original Lodge was designated as a national Historic Landmark in January, 1978.

The Barlow Road was pioneered by the Barlow family in 1846, as an alternate route to the Williamette Valley for Oregon Trail immigrants who did not want to float down the dangerous Columbia River. As a transportation route in Oregon, the Barlow Road is the State's longest-operated, private toll road. By 1903 the first automobiles used the route, but by the 1920's the construction of Highway 26 ended the use of the Barlow Road. However, the new highway followed the old Barlow road route for much of its length, so that today, about half of the length of the original Barlow Road can still be travelled. Several segments still remain as they were when the original road was abandoned as a travel route. The Barlow Road is an integral part of the fabric of the economic and cultural history of Oregon. The Laurel Hill segment of the route, and the Tollgate near Rhododendron, have been nominated to the National Register of Historic Trails. As part of the Oregon trail, the Barlow Road is a designated National Historic Trail.

A growing number of visitors ask for geologic information about Mt. Hood. Old Maid Flat, along the Sandy River has excellent examples of mud flows, tree wells, and buried stumps. Interpretive signing, short spur trails, and a brochure would make this area one of the best and most accessible examples of volcanic activity near Mt. Hood.

The Forest manages eight campgrounds in the Highway 26 corridor. Trillium Lake campground is the largest, and is scheduled for major reconstruction. Plans include a day use area with a shelter, a 200 person amphitheater, a lake front trail system and an increased number of available sites. Lost Creek Campground provides barrier free opportunities for the physically challenged.

Historic Barlow Road Tollgate.

The Highway 26 Corridor also offers a wide variety of trail opportunities, ranging from the very popular Ramona Falls trail, to groomed cross-country ski trails, hiking, and mountain bike trails.

The Clackamas River Drainage - "A National Wild and Scenic Rivers Legacy"

The Clackamas River has long been reconized as one of the most important anadromous and trout fisheries in the Northwest. The outstanding scenery of dense forests and steep canyon walls, and the whitewater boating and streamside camping, have made the Clackamas one of the most popular recreational rivers in the State.

The Roaring River, with its largely undeveloped access, primitive character, and remoteness, provides a marked contrast to the popular Clackamas River.

These two rivers are part of the National Wild & Scenic Rivers System, which is a national legacy of free-flowing, natural rivers. The search continues for other outstanding rivers to be included in the Wild & Scenic Rivers system. Six tributaries of the Clackamas and Roaring Rivers have been studied for eligibility (see Wild and Scenic Rivers section). This will set the stage for the protection of an entire river system, from headwaters to the Forest boundary and beyond, as a State of Oregon Scenic Waterway. The Forest is strongly committed to the protection and management of those "outstandingly remarkable" values of recreation, fisheries, wildlife, and the distinctive scenery for which these rivers have been dedicated.

The Clackamas River drainage is located within a two hour drive from downtown Portland. Recreationists have tended to limit their visits to day or weekend use. The majority of the recreation use occurs from late April through the month of November. Activities begin with the opening of trout fishing season and end with the closing of deer and elk hunting season. Use typically peaks in August.

With much of the recreational interest focused on the Clackamas River, there is a need to provide safe access for rafting, kayaking, fishing, sunbathing, and waterplay. Space for parking, loading and unloading, and working on equipment has been outgrown along the most used portions of the river.

Indian Henry, Fish Creek, Ripplebrook, Rainbow, and Pegleg are established campgrounds. Big Eddy and Carter Bridge are popular day use areas for whitewater enthusiasts, sun-bathers, swimmers, and fishermen.

Bagby Hot Springs is an attraction that is reconized locally and regionally as a special place on the Forest. The two natural hot springs have been developed since 1876, but have long been used by Native Americans. Located adjacent to the Bull of the Woods Wilderness, this historic retreat has been preserved, protected and maintained to provide safe, high-quality facilities for bathing through tremendous cooperation with the Friends of Bagby Hot Springs.

At the headwaters of the Clackamas River is the lake-dotted high country of the Olallie Scenic Area, with its comparatively uncrowded backcountry. This area is primarily used in the summer season, but has recently experienced increased use during the winter. The resort at Olallie Lake is operated under Special Use Permit, and provides accommodations, supplies, recreation equipment and outfitter/guide services.

The Clackamas River and its tributaries provide high quality sport fishing opportunities for salmon, steelhead and trout. Reconizing the authority of state agencies to regulate and manage fish populations, the Forest focuses on management of fish habitat and angling opportunities. The Forest emphasizes this program under "Rise to the Future", which outlines an action plan to enhance fisheries resources and improve fishing. The Forest is dedicated to meeting the needs of today's anglers while conserving natural resources for future generations to enjoy.

East of Mt. Hood -"Ski, Hunt, Fish, Hike and Bike"

The eastern side of the Forest, located on the "dry side" of the Cascade Range, is touted as offering some of the best conditions for a wider range of recreation experiences than found any where on the Forest. Credit is given to the abundant sunshine, and the diversity of ecosystems, topography, and resources.

This diversity is most evident in the vegetative communities, which are a direct reflection of the area's elevation range. It spans from 1,600 feet to over 6,500 feet. The "eastside" contains eight main vegetative zones: Grassland, Pine-Oak, Ponderosa Pine, Douglas Fir, Grand Fir, Western Hemlock, True Fir/Mountain Fir, and Alpine. These eight types support over a dozen species of coniferous trees, from Western Juniper at the lowest elevations to Whitebark pine at the highest points.

Diversity can be found in the topography and in the wildlife. There are more mountain peaks over 5,000 feet in elevation than any other area on the Forest. Despite the relatively dry conditions, the eastside offers excellent fishing opportunities. There are 10 species of game birds and animals, including the largest concentration of silver gray squirrels and wild turkey found on the Forest.

Silver Gray Squirrel

The climate, with it's colder, drier winters and sunnier and warmer summers, offer some of the best conditions for outdoor sports. Because of the drier weather, less dense vegetation, and open terrain, opportunities for cross country skiing, equestrian use, off-road vehicle use, snowmachining, hunting and mountain biking are the best on the Forest. Due to the favorable climate and low elevation, many of the trails are snow free by March, and provide many early season hiking and riding opportunities.

Timothy Lake, Rock Creek and Clear Lake are the most popular destination campground attractions on the east side of the Forest. These campgrounds are popular because they are centered around large bodies of water, and have good public access. In addition to camping, they provide recreational opportunities such as hiking, board sailing, and fishing.

The Eastside offers exceptional dispersed recreation opportunities. The Twin Lakes roadless area offers several outstanding day-hiking loop trails, as well as backpacking opportunities to several backcountry, high elevation lakes (see Appendix C for a more detailed description). McCubbins Gulch is a popular area for summer off-road vehicle use, while the entire Eastside provides vast areas for snowmobiling. The eastside of the Forest also provides many undeveloped and scattered campsites for hunting, fishing, or for solitude with family or friends.

The Eastside also has many excellent opportunities for environmental education and interpretation. The Clackamas Lake Historic Ranger Station, a 210 acre National Historic site, has the facilities to function as a small outdoor school or retreat. The High Rocks area, with its vistas and huckleberry picking, could be the backdrop for the interpretation of local Native American culture. Wildlife viewing at Camas Prairie offers the potential to see sandhill cranes, elk, deer, and coyotes. In addition to the watchable wildlife, there are some historic buildings and a mill site.

Winter Activities and Sports

With generous precipitation, plenty of snowy terrain and a winter season that runs from Thanksgiving to well into summer, the Forest has ideal conditions for a wide variety of winter activities and sports.

The Forest has five developed ski areas that are easily accessible year around via major highways. All ski areas are within a two to three hour drive from Portland, and are used mainly by nearby residents on a day-use basis. Timberline Lodge, however, attracts a limited number of overnight visitors. Cooper Spur, the area most distant from Portland, is used mainly by residents of Hood River Valley. Multorpor Ski Bowl is on the west side; Summit Ski Area is a small facility with one run and one lift. The largest facility, relatively new, and possibly the most popular is Mt. Hood Meadows. Two of these areas, Multorpor Ski Bowl and Timberline, operate summer facilities in addition to the winter ski runs and other amenities. Multorpor Ski Bowl operates a summer Alpine Slide and Timberline offers summer ski runs on Palmer snow field.

Cross-country skiing opportunities are centered along U.S. 26 and Oregon State Highway 35 providing tracked and non-tracked skiing, and snowplay. Two areas of concentrated use are White River and Trillium Basin. Many other areas on the Forest are suitable for these activities but the lack of parking, services, signing and grooming has limited further development.

Cross-country skiing is a popular winter pasttime.

Mt. Hood offers a full range of opportunities for those individuals who are seek challenging backcountry conditions to hone skills in snow camping, winter hiking and backcountry skiing. The popularity of these backcountry sports can not be overstated. Mt. Hood has been scaled by hundreds of thousands of climbers, and is the most frequently climbed glaciated peak in North America. It is estimated that 10,000 climbers a year make the technical ascent.

There are very few areas left on Mt. Hood above 5000 feet (consistent snow level) that have the varied terrain for quality downhill skiing. Eureka Peak has been studied for ski area development. Some good terrain on the north facing aspect offers some potential but the peak lies below the 5000 ft. level.

This section of the chapter focuses on recreation opportunities in general, and demand for recreational use of the Forest's resources. Later sections of this chapter discuss Wilderness, Special Interest Areas, Wild and Scenic Rivers, and Unroaded Areas in more detail.

Existing Situation

Type of Use

In a typical year millions of visitors come to the Forest. In 1986, for example, nearly 7 million recreational visits were recorded, which equaled 4.7 million "Recreation Visitor Days" (RVDs). A Recreation Visitor Day, or RVD, is 12 hours of visitor recreational use, in any combination of people or hours. If 1 person visits the Forest 12 hours, that is 1 visitor day. Or, if 12 people visit the Forest 1 hour, the result equals 1 visitor day.

The accompanying Table III-35 presents the recreation visitor days occurring on the Forest, and summarizes the most popular recreational activities on the Forest. The listed activities occurred over the whole range of the Recreational Opportunity Spectrum (ROS), which will be explained in detail in the next part of this section. According to current estimates of activity, driving for pleasure, camping, and viewing the scenery account for more than half of the total recreational use of the Forest's resources.

Recreational use of the Forest is one of its important benefits. According to a 1984 Forest Service RIM report, Recreation ranked eighth in the Nation for total RVD's. It ranked 28th out of 123 national forests in total recreation receipts. In 1984, more than two million people visited Multnomah Falls. It is the most popular feature on the Forest, and the most popular highway stop in Oregon. Timberline Lodge drew more than a million visitors in 1981. It is the second most popular attraction on the Forest.

As part of the State Comprehensive Outdoor Recreation Plan (SCORP), Oregon participated with Washington and Idaho in the regional 1987 Pacific Northwest Demand Survey. The purpose of the survey was to determine the kinds of recreation people participate in, and the frequency and location of participation. It also makes projections for use in the year 2010. For the purposes of this survey, the three-state area was divided into 18 regions. Projections for the Mt. Hood National Forest are included in Regions 7 and 10. The demand survey was very comprehensive, and included private, State and Federal lands, and recreation facilities. For this reason, the Mt. Hood N.F. is not specifically identified. The recreation use trends identified for Regions 7 and 10 are indicative of recreation activities on the Mt. Hood. Information from the 1987 Pacific Northwest Demand Survey will be used to supplement information provided in the following discussions.

Table III-37 Recreation Visitor Days (RVD's) According to Activity[1] (Fiscal Year 1986)[2]

Use Activity	RVDs
Driving for Pleasure	860,100
Camping	819,200
Viewing Scenery	614,500
Gathering Forest Products	279,800
Downhill Skiing	275,000
Hiking and Walking	316,700
Fishing	148,100
Resort Use	136,000
Bus Touring	150,200
Cross-Country Skiing	98,500
Recreational Cabins	130,600
Hunting	87,900
Picnicking	74,800
Motorcycle and Scooter Use	66,800
Nature Study	53,500
Canoeing, other small watercraft	41,900
Using Interpretive Programs	42,700
Snowmobiling	36,100
Horseback Riding	26,300
Snowplay (incl. sledding and tobboganing)	25,000
Swimming and Water Play	44,400
Power Boating/Sailing	25,000
Total RVDs	4,353,100

[1] *1986 Recreation Information Management (RIM) Estimates, Report No. 2300-1.*

[2] *A fiscal year runs from October 1 through September 30*

Type of Opportunities: Recreation Opportunity Spectrum (ROS)

The inventory system used by the Forest Service to classify recreation opportunities is called the Recreation Opportunity Spectrum (ROS) system. This system describes seven categories of recreational settings available to people, in which they are offered a spectrum of recreational activities during their visit. As land managers, the Mt. Hood National Forest provides a spectrum of recreational settings in which a variety of activities may take place. The quality of the actual experience is largely the users responsbility. The Forest Service is responsible for the amount and quality of opportunities; the experience is up to the user. Criteria used in the ROS inventory of the Forest included:

- Opportunities for solitude and encounters with other people.
- The degree of site development.
- The chances of challenge and risk.

As shown by the criteria, the ROS system emphasizes the experience of the recreational visitor, rather than the site's overall characteristics. For example, the edges of a Wilderness or unroaded area may be affected by nearby, heavy recreation uses which minimize the opportunity for solitude. In the ROS spectrum, such an area would be classified "Roaded Natural" even though it does not contain any roads. An actual example of this situation is the Eagle Creek Trail in the Columbia Gorge. The trail is crowded with hikers on most summer weekends and holidays, and is classified "Roaded Natural".

The seven categories of the ROS system begin with an undisturbed, natural environment that has little or no contact with other people, and end with a substantially modified environment with a large number of contacts with other people. The categories are called:

- Primitive (P)
- Semi-Primitive, Nonmotorized (SPNM)
- Semi-Primitive, Motorized (SPM)
- Roaded Natural (RN)
- Roaded Modified (RM)
- Rural (R)
- Urban (U)

Primitive (P): Primitive opportunities occur in an unmodified, natural environment, have little or no interaction with other users, and show minimal evidence of other uses. The chance of experiencing solitude is very high. Self-reliance is required. Travel is by foot, or by pack stock on trails or cross country.

Semi-Primitive Nonmotorized (SPNM): SPNM experiences take place in predominately natural-appearing environments of moderate size, in which other permanent structures are rare. Interactions between users are low; there is no motorized usage. The chance of experiencing solitude is fairly high.

Semi-Primitive Motorized (SPM): Opportunities for recreational experiences are provided by natural environments that are similar to those in SPNM areas, except that off-road vehicles are permitted. The chance of encountering them is probable. Disturbance of the environment by people is more evident. Users will interact with other people to a greater, degree, which results in somewhat reduced chances of experiencing solitude.

Roaded Modified (RM): In these roaded environments, vegetation has been substantially modified, some self-reliance may be required, and developed campsites are not usually available. Roads, timber sale landings, logging slash, and debris may be very evident, but these experiences are usually accompanied by feelings of independence and freedom. Moderate interaction with other users is probable.

Roaded Natural (RN): Opportunities for recreation occur where the environment appears predominately natural, as seen from places where people are most likely to visit. Permanent roads, including highly traveled roads, improvements like developed recreational sites and certain trails are common. These usually harmonize with the environment. Minimum facilities are provided in campgrounds. Interactions with other people may be fairly high, and the chance of solitude is low.

Rural (R): In this setting, the natural environment has been highly modified, yet it remains attractive. Good roads, buildings, and other improvements are typical. Opportunities for interactions with other people are very great. Many facilities have flush toilets, lighting, and piped-in water for public convenience. Except for downhill skiing, few challenges or risks are available.

Urban (U): These settings are characterized by complex facilities. Interaction with other people is very important to the visitor, as is the convenience of improvements and recreation opportunities. A natural-appearing backdrop may be present, but the environment is urbanized to the extent of having paved streets and traffic lights. City parks or resorts illustrate the nature of this ROS category.

Public access to the Bull Run Watershed is currently forbidden, and access in The Dalles Watershed is restricted to the road. The remainder of the Forest has been inventoried for its recreation opportunities. The results are included in the following table.

Table III-38 Existing ROS Condition of the Forest (Excluding the Bull Run and The Dalles Watersheds)

ROS Category	Acres	Percent of Total
Primitive	53,806	6.0
Semi-Primitive Nonmotorized	169,206	18.0
Semi-Primitive Motorized	7,454	1.0
Roaded Natural	163,022	17.0
Roaded Modified	550,434	57.0
Rural	5,382	1.0
Urban	60	<1.0
Total	949,364	100

Relationship to the Natural Environment

The natural environment of the Forest is the key to its benefits as a place for recreation in the outdoors. However, the impact of human beings on the natural world may often be negative. The changes may be small and subtle, or large and intrusive. The extent of the changes vary with the degree and frequency of the impact.

The impact of highly developed sites is intense and localized. Construction on the site disturbs natural plant cover. Some wildlife species are displaced. Heavy human use can compact or erode the soil, and cause further damage to plant cover. People normally congregate in developed sites to such an extent that they can deplete local natural resources, such as fish. Concentrations of waste and refuse on developed sites can pollute ground or surface water.

Dispersed recreation usually has a less intense impact when it is spread over a large area. Popular areas that receive the heaviest use are more likely to experience negative effects than those that are lightly used. Environmental changes usually become more serious at higher elevations, where the climate is severe and the soil may be fragile. Cross-country travel, especially when hikers attempt to shortcut the switchbacks on steep trails, can cause visible damage by trampling plants and disturbing the soil. Recreational travel on roads and trails limits the human impact on soil and vegetation.

The self-reliance required for recreation that occurs away from developed campgrounds may produce further changes in the natural environment. Examples include building fire, rings or disposing of human wastes. These changes are more evident where the area is undeveloped, than they are where sites have obviously been modified.

Relationship to the Human Environment

Large numbers of people in metropolitan Portland, as well as those in other communities near the Forest, look upon the Forest as their main source of outdoor recreational opportunities. However, communities do not always agree on the types of recreation that should be emphasized. The differences in recreational interests sometimes create conflicts. Motorized uses of trails conflict with nonmotorized uses. Cross-country skiing may conflict with snowmachine skiing. People who want full hookups in developed sites do not enjoy the same activities as people who want primitive or rustic experiences.

A snowmobiler explores snowy slopes.

Roads built to meet the Forest's management objectives are used by visitors for sightseeing, or to travel to campsites and trailheads. They are also used to reach their favorite areas for hunting, fishing, and other activities. Roads can obviously change the type and availability of recreation opportunities in an area. If roads increase roaded opportunities, they simultaneously decrease unroaded ones. The section on transportation in this chapter provides additional information about subject.

Increases in demand for recreation on the Forest are generally expected to be proportional to the increases in the population of the surrounding areas. Future demand should be greatest on the west side of the Forest near major routes of access, such as Interstate 84 in the Columbia Gorge. Little increase in demand is expected to come from the east side of the Forest, despite evidence of an upward demand trend. Wasco County, for example, accounts for only 2% of the total recreation on the forest, although it includes the eastern parts of the Hood River, Bear Springs, and Barlow Ranger Districts. An accompanying table (III-39) summarizes the Forest's ability to meet total recreation demand in RVD's that are projected to the year 2040.

The numbers of users for developed and dispersed demand are predicated on average use per year. This average is sometimes exceeded under peak flow conditions (for example, some weekends during the summer). The actual demand levels vary with the particular recreation activities

There are different types and locations of recreational experiences within the broad categories of developed, dispersed, and wilderness recreation. Within these subcategories, there may be shortages. For example, the Forest can meet overall demand for developed recreation during the next 15 years. However, it may already have a short supply of picnic sites around Multnomah Falls.

SCORP, and the results from the 1987 Pacific Northwest Demand Survey, predict significant discrepancies in several recreation activities for Regions 7 and 10. For example, Region 7 (Portland Metro Area) campsites receive 10% of the Statewide use, but only provide 7% of the facilities. This would suggest that an increase in the supply of these facilities is warranted. Region 7 receives 30% of the boat ramp use, and provides 11% of facilities. Expressed in a ratio of % use/ % facilities, Bike trails = 41%/14%; designated ORV trails = 12%/0%; cross-country ski trails = 32%/7%; and bridle trails = 25%/11%. The SCORP projections (for specific Recreation activities) will be utilized in more detail when developing the future recreation program identified in the Forest Plan. At that time, the relative need will be analyzed for a particular type of recreation facility.

Table III-39 Ability to Meet Recreation Demand in RVD's Per Year [1]

Activity	Practical[2] Capacity	Current Use	Demand by[5] Year	Demand in 2040 as % of Current Practical Capacity
Developed Rec[3]	3,042,300	1,453,900	2,873,300	94%
Dispersed Rec	8,524,300	2,728,100	21,357,000	251%
Wilderness[4]	143,632	166,500	899,000	626%
Totals	11,752,600	4,348,500	25,129,300	214%

[1] *Current use and demand projections based on 1983 Recreation Information Management (RIM Estimates, Report No. 2300-1).*

[2] *The practical capacity is the theoretical maximum capacity which has been adjusted downward to account for factors that significantly affect recreation use. These factors include weather conditions (e.g. snow), the difference between weekend and weekday use, the physical ability of the site to withstand environmental damage, an the actual usable acres of a site (such as swampy or brushy areas).*

[3] *Includes Privately-Operated Sites.*

[4] *Based on a wilderness carrying capacity coefficient of .75 RVD/AC/YR in the primitive trailed zone and 1.0 RVD/AC/YR in the semi-primitive trailed zone.*

[5] *Historically, increases in developed recreation use on the Forest have approximately 1.5% per year (Based on Regional Data specific to the Mt. Hood Forest). Demand for dispersed rec and wilderness is based on SCORP (1988) projections.*

Recreation on the Mt. Hood National Forest also contributes significantly to the region's economy. Within the counties around the Forest, recreation activities are responsible for several thousand full-time and part-time jobs. These range from summer jobs for high school and college students, to full-time jobs in industries that directly or indirectly support recreation.

Recreation-related expenditures contribute millions of dollars annually to the regional economy. Many communities around the Forest are very dependent on the jobs that recreation activities provide. This is especially true in the communities along Highway 26. More information on the importance of, and impact to, local economies from recreation in the management alternatives is in Chapters 2 and 4 of the Final EIS.

Developed Recreation Management and Facilities

Developed recreation, as this term applies to the Forest, is any recreation occuring on a site with facilities that accommodate recreational visitors. These sites may be highly developed with sophisticated facilities, or they may have minimum development, and provide only the kinds of facilities that are needed to protect public health and safety.

Forest Service Developed Site Facilities The Forest has a wide variety of developed recreation sites that are public and privately owned. A total of 152 developed sites on the Forest have a practical capacity of more than three million RVDs per year (including public and private sites). These sites include campgrounds, picnic grounds, boating facilities, visitor information centers, winter recreation areas, organizational camps, and summer homes. A few campgrounds offer specialized facilities. Joe Graham, Herman Creek, and Riley horse camps have corrals and facilities for unloading horses. Thirty-one of these developed sites have facilities that are available for physically handicapped persons. Most of the specialized facilities are campgrounds or picnic grounds although an observation facility and a boat launch have been constructed. Information about campgrounds and other developed recreation sites is available at Visitor Information Centers at Multnomah Falls and Timberline Lodge, at Ranger Stations, and at Olallie and Clackamas Lake Guard Stations. Approximately 1 1/2 million RVDs were recorded within developed sites in 1983.

The current use of most of the publicly owned/developed recreation sites on the Forest now equals or exceeds their practical capacity. The Forest's developed recreation sites have also continuously been used at levels that equal or exceed the type of use that they were designed to accommodate This has caused deterioration; rehabilitation of most developed sites has become necessary. Because current use of existing sites greatly exceeds practical capacity, the only realistic way to meet the demand is to rehabilitate and expand the existing developed sites, add new developed sites, or do a combination of both methods.

The operation and maintenance of existing developed sites are currently at a substandard level that meets only minimum requirements for public health and safety. This level will not allow for the maintenance of existing facilities over time, and no funding has been provided for upgrading facilities or completing backlogged rehabilitation needs. Based on 1983 RIM information, the total backlog presently needed to rehabilitate existing developed sites to Condition Class 1 has been estimated at $5.7 million. For a developed facility to be in Condition Class 1, it must be in satisfactory condition that is safe and sanitary, and its annual maintenance cost must not exceed 10% of replacement cost. Condition classes range from Class 1, which are sites in satisfactory condition, to Class 8, which must be eliminated due to poor condition. This estimated cost includes the costs for sites that are developed and operated by the Forest Service, and costs for sites on the Forest's lands that are operated by private enterprises. The rehabilitation and maintenance of existing sites that are already in good condition protects capital that is originally invested in site facilities. This usually costs far less than building new sites, or expanding existing ones.

Although this situation now exists because of past funding limitations, it is the Forest's intention to provide the quality of recreation that the public seeks.

Winter Recreation Facilities. The Forest has five developed downhill ski areas that are easily accessible year around via major highways. All ski areas are within a two to three hour drive from Portland, and are used mainly by nearby residents on a day-use basis. Timberline Lodge attracts a limited number of overnight visitors. Cooper Spur is the area that is most distant from Portland, is used mainly by residents of the Hood River community. Multorpor Ski Bowl is on the west side. Mount Hood Meadows is the largest ski facility. It is relatively new, and is possibly the

Skiing is available throughout the year.

most popular. Summit Ski Area is a small facility with one run and one lift. Two of these areas, Multopor Ski Bowl and Timberline, operate summer facilities. in addition to the winter ski runs and other amenities. Multorpor Ski Bowl operates a summer alpine slide, and Timberline offers summer ski runs on the Palmer snow field.

Private individuals or firms operate all downhill skiing facilities on the Forest under Special Use Permits. The two lodges at Timberline are owned by the Forest; the others are owned by the permittees. Timberline Lodge is a special situation, because it has been designated as a National Historic Landmark. A second day-use lodge was completed in 1981 when heavy use of the main lodge by skiers caused tremendous wear on the facilities. The Forest has approved master plans for current and future development of ski facilities at Timberline, Multorpor Ski Bowl, Mt. Hood Meadows, and Cooper Spur.

Capacity. The five downhill ski areas on the Mt. Hood National Forest have the following capacities:

Table III-40 Downhill Ski Area Capacities

Area	Existing PAOT*	Per-mitted PAOT	Theoretical Max PAOT**
Cooper Spur	300	1,140	2,500
Multorpor/Ski Bowl	2,475	6,400-7,800***	8,700
Timberline	4,665	4,665	12,000****
Summit	1,500	1,500	****
Mt. Hood Meadows	7,575	8,600	20,000
	16,515	22,305	43,200

**PAOT (Persons at one time) is the number of people in an area, or using a facility at one time.*

***This estimate reflects the maximum capacity to which the area could be developed, at some time in the future. It considers the available terrain, snow conditions, known environmental concerns etc.*

****The Multorpor 1981 EIS allowed a range of future PAOT of 6,400-7,800 depending the mix of chair lifts used. For this analysis, the 6,400 was assumed.*

*****The logical future expansion of Summit and Timberline is to develop the area between the existing permit boundaries and areas to the west.*

Utilization. Currently, the five ski areas on Mt. Hood receive peak use on weekends and light to moderate use mid-week. This fact is typical in the ski industry for local and regional resorts. Assuming an average 140 day ski season, the average utilization was approximately 29 percent in 1988-89.

Annual Visits (88-89)

Existing PAOT x Season (days) = Utilization

$$\frac{675{,}000}{16{,}515 \times 140} = 29.19 \text{ percent utilization for 1988-89}$$

There are numerous predictions about future ski industry growth rates. If we assume that the current utilization levels are appropriate (such as the frequency of weekend crowding), then capacity must grow at a rate that is equal to the growth in skier visits. Examples:

- If skier visits grow at 2.8% per year, as predicted by SCORP, then in ten years the PAOT needed to maintain a 29.19 percent utilization would need to be 16,977 PAOT.
- If skier visits grow at 4% per year, then the PAOT would need to be 23,121 PAOT.
- If skier visits grow at 6% per year, the PAOT would need to be 26,424 PAOT.

Growth in skier visits will affect other resources, such as the transportation systems, which could limit or change the rate of growth. Public habits could change. Midweek use could increase, or skiers could become more tolerant of week-end crowding and lift lines. These trends are very difficult to predict.

Demand. Future demand for skiing is also extremely difficult to predict. Changes in demographics, population, economics and leisure time habits will probably effect skiing significantly, but we have know way of knowing what that effect will truly be.

Each Mt. Hood ski area currently fills a "niche" in the Portland area ski market at the time. Because different types of snow conditions, terrain, price, and atmosphere are available, the consumer has the option of choosing the type of experience he/she wishes. Ski areas set prices and develop marketing efforts to capture a specific piece of the available market, and to attempt to attract new skiers.

Because of the different types of skiing experiences available on Mt. Hood, a change in one area may not have a direct and opposite effect on the other areas. In addition, each area has a different financial situation and management ability. Factors such as weather will play a significant role in future demand or growth at a given area. Demand for one type of experience offered at "Area A" may grow much faster than the demand for the experience offered at "Area B".

For these reasons, it is not logical to limit or restrict one ski area's growth opportunity simply because another area has not been able to implement all of it's approved PAOT expansions. In this case, competition will be very healthy, and could result in better consumer satisfaction and lower costs. For this reason, demand should be evaluated on a case-by-case basis, as individual areas consider expansion.

New Downhill Ski Areas. Over the years there has been analysis of additional downhill ski areas on the Mt. Hood National Forest. An inventory of potential sites was included in the 1963-64 National Forest Recreation Plan for the Mt. Hood Forest. In that report, 16 sites were considered. Of these sites, five are the current Mt. Hood ski areas, five others are now in wilderness, two are in scenic areas, and the remainder have obvious resource conflicts (such as spotted owl habitat areas, presence of pine martin, bald eagle, or cultural resources).

In 1966 another site, Eureka Peak, was proposed as a new downhill ski area and resort. This project was suspended in 1967 by the applicant, and has apparently been inactivated.

Another site, Bird Butte, is believed to have been considered as a ski area at one time. Documentation on this site does not exist.

None of the potential new areas from the 1963-64 study, Bird Butte, or the Eureka Peak proposal, stand out as being obviously viable at this time, because of a variety of problems. In addition, there is the potential for expansion of the existing five Mt. Hood areas to allow a significant increase in PAOT.

Privately Operated Facilities. A total of 589 facilities, with an estimated capacity of more than two million RVDs, are privately operated on the Forest under Special Use Permits. Some of these facilities are available for public use. Others operate for the benefit of individuals, or members of a specific group. A restaurant and gift shop at Multnomah Falls are owned by the Forest Service, but a permittee operates them as public facilities. Privately operated resort facilities are open at Lost Lake and Olallie Lake. Some organizations have set up camps for their members on the Forest. Individuals may own summer homes on the Forest, if they have the required permit. Suitable sites for snowplay areas and cross-country skiing on the Forest are very limited and popular, so that demand exceeds supply.

Non-Forest Recreation Facilities. Direct relationships between the demand for off-Forest facilities and the demand for Forest facilities do not exist. The two types of facilities offer different types of recreational opportunities, and require different amounts of travel time. However, it seems clear that if recreation opportunities that are available from off-Forest sources remain at their present level (or decrease), any excess in recreation demand would shift over to the National Forest.

Present opportunities for recreation in the areas that are immediately adjacent to the Forest are primarily limited to day-use facilities. Overnight accommodations are only provided by a limited number of state parks, local community parks, a few private RV parks and campgrounds, privately owned motels, and private off-Forest residences. Opportunities for off-Forest recreation, however, is not restricted to the immediate vicinity of the Forest. People seeking outdoor recreation, primarily in metropolitan Portland areas, travel to a number of different places that range from the Oregon coast to eastern Oregon. They participate in a highly diversified mixture of activities. (Recreation opportunities that are different from those that are provided on the Forest should be available anywhere, within a reasonable travel distance.)

Public recreation opportunities appear to be declining on a state-wide basis, and overnight camping accommodations appear to be in very short supply. Some private campgrounds that are suitable for RVs and tents are being converted to limited membership operations. Some dispersed camping areas with historically high use suffer from site degradation, and are being closed to overnight stay. Many of the state parks have initiated a reservation system for overnight stay, and they typically fill to capacity on summer weekends.

Multnomah Falls Restaurant

It's possible that privately owned facilities could be expanded to meet increased demand. If this were to occur, areas near present recreational sites, such as Sandy River, the Clackamas River, and the Hood River, are the most logical places for development. Other possible opportunities for expansion in the private sector remain unknown at this time. The most important consideration is the Forest's location, which is within a two-hour drive from metropolitan Portland. This puts the Forest in a natural position to receive much of the overflow when private facilities are filled.

Developed Recreation According to ROS Classes

As shown in the accompanying table, developed recreation does not occur in Primitive, Semi-Primitive Non-Motorized, or Semi-Primitive Motorized areas. All developed recreation takes place in the remaining four ROS (Recreation Opportunity Spectrum) classes. The table shows how developed recreation is distributed by ROS-classified sites.

Table III-41 Current Use of Developed Sites by ROS Classes

ROS Class	RVDs	% of Total
P	0	0%
SPNM	0	0%
SPM	0	0%
RN	843,650	58%
RM	34,100	2%
R	388,950	27%
U	187,200	13%

Management Concerns

One of the most important concerns of Forest management is the relationship between the capacity of Forest recreational facilities and public demand. According to Recreation Information Management (RIM) estimates, the total demand for developed recreation, including Forest sites and privately owned facilities, is now at 48% of total capacity. Demand is projected to reach 94% of capacity by the year 2030. Projected demand for developed sites managed exclusively by the Forest will exceed capacity by the year 2006, while the demand on privately owned sites is scheduled to reach only 78% of private capacity 24 years later. The projected shortfall of sites managed by the Forest is aggravated by the uneven distribution of demand throughout the year, and by activity as shown by SCORP data. Some popular developed sites, such as Lost Lake, Trillium Lake, the Timothy Lake area, and the Clackamas River drainage are often pushed to extremes during summer weekends and holidays. Also, the extremely heavy use of Timberline Lodge and Multnomah Falls adds to the unbalanced distribution of demand.

Dispersed Recreation Management

Dispersed recreation, as this term is used on the Forest, is any recreational activity that occurs outside of sites that are developed or managed to concentrate recreation uses. Dispersed recreation may be motorized or non-motorized. Current opportunities for dispersed recreation on the Forest are quite diversified, and range from backcountry hiking or mountain climbing to driving for pleasure and camping in recreational vehicles. Visitors who come to the Forest in different physical conditions, with varying interests and levels of outdoor skills, can usually find much to do.

Table III-42 Projected Recreation Demand Outlook for Developed Sites RVDs/Year

Type of Site	Practical Capacity	Current Use	Current Use as % Capacity	No. Years to Reach Capacity	Demand by Year 2040	Demand as % of Capacity
FS Man-aged Sites	959,239	632,728	66%	26	1,250,461	130%
Privately Oper-ated Sites on Forest	2,083,061	821,172	39%	79	1,622,839	78%
Totals	3,042,300	1,453,900	48%	56	2,873,300	94%

[1] *Source: Current use represents 5 year average (1979-1983) of Recreation Information Management (RIM) Estimates.*

Table III-43 Forest Recreation Trail Mileages

Existing System										
		Adequate Miles					Inadequate Trails[2]			
District	NRT[1]	Pacific Crest National Scenic Trail		Wilderness Trails	Summer Trails	Winter Trails				Total Miles
		Wilderness	Other				Wildernes	Other	Winter	
Barlow	12			33	58			28	14	145
Bear Springs			32	1	17	75[3]			40	165
Clackamas	5	4	24		69			41		143
Columbia Gorge		14	7	29	139			16	37	242
Estacada				35	69			49	8	161
Hood River			14	53	68	25	5	6	14	185
ZigZag	17	10	6	78	50	76	6	31	18	292
Total Miles	34	28	83	229	470	[3](165) 176	11	171	131	1,333

[1] *National Recreation Trail-designated by Congress or administrative act.*

[2] *A trail that does not meet current construction or maintenance standards.*

[3] *Winter trails in this category include 9 miles of trails that are used in the summer, and are included in the total summer trail miles for this District.*

Existing Situation

Prior to the 1960's, access to many parts of the Forest was by horseback, and followed along an extensive trail system. In recent years, roads replaced many of these trails, or the trails were abandoned. Although most of these remaining trails and trail segments have not been maintained, a few have survived. They still retain much of their original character.

The Forest's existing trail system totals 1,200 miles. The system makes a variety of dispersed recreation activities possible. They include hiking, backcountry camping, horseback riding, off-road vehicle (ORV) driving, cross-country skiing, mountain bicycling, and snow machine use. The total includes 165 miles of winter trails that are managed for cross-country skiing and snow machine use, and 257 miles of hiking trails in Wilderness. An additional 131 miles of trails on the Forest do not meet current standards.

Visitors interested in mountain hiking or climbing can find trails that vary in difficulty from easy and level, to rugged and challenging. The number of people who climb Mt. Hood each year is estimated to exceed 10,000. Hiking opportunities are available all year. This is because a number of trails, including many in the Columbia Gorge, are below the levels of snow accumulation.

The present level of maintenance of most trails is to retain their basic condition. With trail use predicted to increase, there is an opportunity to improve the existing miles of trails. By revising or completing existing District trail development plans, opportunities for additional miles of trail to compliment or improve the present system will be identified.

The accompanying table (III-42) summarizes the miles of trails managed by each Ranger District. The trails identified as inadequate need to be reconstructed at the present time. These miles contribute to the backlog of rehabilitation needs for the dispersed and wilderness recreation programs.

Off-road Vehicle (ORV) Recreation. According to 1984 Recreation Information Management (RIM) Estimates, Report No. 2300-1, ORV-based recreation on the Forest currently accounts for only 2% of the recreation total. However, this form of recreational use of the Forest is increasing in popularity. SCORP predicts ORV use will in-

The slopes of Mt. Hood are challenged by many climbers.

crease by 4.0% - 4.8% yearly, depending on the vehicle type. A variety of ORVs are used, including four-wheel drive vehicles, motorcycles, all-terrain vehicles, and snow machines. At this time, ORVs are primarily limited to the existing system of roads and trails. Some areas on the east side of the Forest are an exception to this use pattern.

The Forest prepared an ORV Management/Use Plan in compliance with Executive Order 11644 dated February 8, 1972. The Order was issued to provide for a unified federal policy toward ORV use. As approved December 1976, this plan was designed to assure that the use of ORVs will minimize damage to the environment, promote the safety of users, minimize conflicts with other users of the Forest, and provide a high-quality recreational experience for both ORV and non-ORV users. The recommendations incorporated into the existing ORV Plan resulted from Forest Service/User Group interaction during the ORV planning process. ORVs are currently permitted Forestwide, except where designated areas have been closed or restricted under the Plan. However, the ORV Plan and policy are being revised, as described in Appendix C of the Forest Plan. The total capacity for ORV uses on the Forest is not known at this time.

Dispersed Winter Recreation. Cross-country skiing is the most popular form of dispersed winter recreation on the Forest. SCORP predicts a 2.8% annual increase in use for the next 10 years. Other important dispersed winter recreation activities include snow machine use, winter camping, winter climbing, and snowshoeing. Winter recreation in dispersed areas in 1983 totaled 148,400 RVDs.

The most popular areas for cross-country skiing are located in the vicinity of Mt. Hood. Existing trails offer opportunities to accommodate skill levels ranging from beginning to advanced. Two special types of cross-country skiing are relatively new to the Forest. They are telemarking and track skiing. Telemarking occurs mostly within developed ski areas, but the demand for groomed trails for track skiing is rapidly growing. Two areas offering this type of opportunity are the White River area and the Hood River Meadows area. A need for additional parking spaces has been identified.

General Dispersed Recreation. The most popular dispersed recreation activities on the Forest are: driving for pleasure, viewing the scenery, gathering forest products, and hiking. Due to the proximity to a large, metropolitan area, day-use activities dominate the dispersed recreation use of Forest areas. One-day trips up the Columbia Gorge, over the Mt. Hood Loop, or through the Clackamas River Corridor are quite popular. These day trips offer a variety of things to do, including fishing, short hikes, and enjoying the landscape.

Adults, as well as children, enjoy fishing clinics.

Opportunities for recreational fishing on the Forest range from trout fishing in streams and lakes to the pursuit of anadromous fish such as salmon and steelhead in large rivers. In the most accessible trout fishing areas, the catch depends mainly on planted fish. However, the fishing for native types can be excellent for anyone willing to walk a few miles. Success in catching salmon and steelhead depends primarily on the timing of the fish runs. Most recreational fishing for anadromous species occurs just off the Forest in the Clackamas, Sandy, Hood, and Salmon Rivers. However, a substantial summer steelhead fishery in the upper sections of those rivers has developed within the Forest in the last few years.

Recreational hunting opportunities on the Forest are varied. The most popular game species are: deer, elk, grouse, mountain quail, turkey, and silver-gray squirrels. The most popular big-game hunting on the Forest is for blacktail deer.

Although some visitors engage in canoeing, kayaking, and rafting on some of the larger lakes and the Clackamas River, water sports are not an especially important Forest activity at this time.

Future growth and demand for dispersed recreation varies by activity. The highest growth activities on the Forest, as predicted by SCORP, are bicycling and day hiking (12% and 11.9% annual increases, respectively). Other high growth activities include lake non-motor boating, outdoor photography, nature study/wildlife observation, visiting interpretive centers, and recreation vehicle camping. These high growth trends will be considered when developing the future forest recreation program, as described in the Forest Plan.

Special Places

Introduction. Special Places are essentially those places on the Mt. Hood National Forest that have a special meaning to people. These places can range in size and type from roadside campsites of less than an acre, to a Wilderness Area of several thousand acres. Peoples' reasons for emotional attachment to these sites are as varied as the places they feel close to. The definition of Special Places is based on the perceptions of the people using the forest, and not by the people that are managing the forest. Special Places are always defined from the point of view of the user (pers. comm. Roger Clark). These areas are significant because an individual's total concept of National Forest management and image can be shaped by the way their Special Place is managed. This impression is especially important when considering the level of trust between recreationists and the Forest Service, and the ability of the Mt. Hood National Forest to meet their expectations and provide high quality customer service and satisfaction.

Definition. In defining Special Places, it is important to note that the recreating public actually defines the place that is personally special to them. As natural resource managers, the Mt. Hood National Forest must be sensitive to these places.

There are generally two types of special places: macro-sites and micro-sites.

Macro-sites. Macro-sites are those places regionally or nationally recognized as places of significance. Examples of macro-sites are: congressionally designated Wilderness Areas or Wild and Scenic Rivers, major tourist attractions such as Timberline Lodge or Multnomah Falls, National Recreation Trails, the Pacific Crest Trail, and Special Interest Areas. These are all Special Places to many people. Macro-sites are typically large, easily recognizable features. In most cases a macro-site will contain many micro-sites.

Pacific Crest trailhead.

Micro-sites. Micro-sites are more challenging to manage because of the difficulty in identifying them. The primary challenge in managing micro-sites is developing a sensitivity to their existence. Micro-sites are often overlooked during project planning because they are seen as ordinary parts of a broader landscape. Micro-sites are much more difficult to define because they are often very small, and can be inconspicuous. They can be a favorite dispersed camping site, secret fishing hole, or majestic stand of ancient trees along a trail. Essentially, they are any place a person holds dear to them, and places personal value in (Clark 1988).

Special Places have not been inventoried on the Forest at this time. There is not a good system for tracking and monitoring the effects of other management activities on these places. In many cases, these places are identified and addressed at the project planning level, or at the implementation level.

Backcountry Lakes. Backcountry or non-wilderness high lakes on the Mt. Hood National Forest provide a variety of important recreational settings. Reservoirs are generally not included as backcountry or high lakes. The Mt. Hood has over 100 inventoried backcountry lakes. These lakes vary in size from less than one acre to over 200 acres, and are between one and 100 feet deep. They occur at various elevations and locations across the Forest.

Olallie Lake scenic area.

Backcountry lakes occur in a variety of ROS settings, and provide opportunities for fishing, hunting, camping, viewing scenery, nature study, wildlife viewing, and interpretation. In addition to the obvious recreation value, backcountry lakes are also the focus of important fish, wildlife, associated riparian values, and timber values.

Dispersed Recreation by ROS Classes. The distribution of recreation uses between Recreation Opportunity Spectrum (ROS) classes appears consistent with the overall pattern of recreational use of the Forest. The pattern shows that more than 90% of the activities are motorized. The distribution of dispersed recreation by ROS classes is:

- Approximately 79% of the total distribution occurs within areas classified as Roaded Natural and Roaded Modified.
- An estimated 10% of the dispersed use occurs within areas classified as Rural. An estimated 8% is within areas classified as Semi-Primitive, Non-Motorized.
- Semi-Primitive Motorized and Primitive ROS classes account for 1% and 2% of dispersed use, respectively.

The Forestwide ROS classification of trails shows that most of the trail mileage (37%) falls within the Semi-Primitive Non-Motorized class. Roaded Modified accounts for 31%. Roaded Natural constitutes the final 23%.

Management Concerns

As a general rule, dispersed recreation is not managed as intensively as developed recreation. The main concerns are periodic fire prevention, and winter recreation patrols. Some areas may be closed, and campfires restricted, in periods of high fire danger.

Another concern is the relationship between demand and supply. The Forest appears able to meet projected demands for roaded, dispersed recreation. However, the present capability to supply recreational opportunities such as hiking on trails in Primitive and Semi-Primitive Non-Motorized areas is predicted to fall short of satisfying demand. Current trends also indicate that the demand for some types of dispersed recreation facilities and services may exceed the Forest's future capabilities. Some examples are the demands for Sno-Park areas, trailheads, maintained trails, and backcountry patrols.

Skiing demand causes crowding of snow parks.

Wild and Scenic Rivers

Designated Rivers

Background

The Wild and Scenic Rivers Act of 1968 (Public Law 90-542) states:

"Certain selected rivers of the nation which, with the immediate environments, possess outstanding remarkable scenic, recreational, geologic, fish, and wildlife, historic, cultural, or other similar values, shall be preserved in free-flowing condition, and that they and their immediate environments shall be protected for the benefit and enjoyment of present and future generations."

On October 28, 1988 the Omnimbus Oregon Wild and Scenic Rivers Act of 1988 (Public Law 100-557) was signed into law. Part of the Act added 40 additional rivers to the Wild and Scenic Rivers system, five of which were on the Mt. Hood National Forest. These five rivers are the Clackamas, Roaring, Salmon, Sandy, and White (Map III-19).

Existing Situation

The Wild and Scenic Rivers Act requires that boundaries for the river corridors be established within one year after designation. For the five rivers on the Forest designated in the 1988 Act, an interim boundary that is 1/4 mile each side of the average annual high water mark of those rivers is being used. When the final management plans are developed for each river, those boundaries will be reevaluated and adjusted as necessary to protect those resources and values shown to be important in the management plan. These final boundaries will be limited to a maximum of 320 acres average within the corridor per river mile for the length of the designated portion of the river.

The Act also requires that a river management plan be developed which will outline specific management guidelines for each river within three years of its designation. The Forest is in the process of developing those plans at this time.

The five designated rivers were broken into segments and were given a classification of either Wild, Scenic, or Recreational. These categories basically meet the definitions below:

Wild Rivers. Wild River segments must be free of impoundments, generally accessible only by trail, with watersheds or shorelines essentially primitive and water unpolluted.

Scenic Rivers. Scenic River segments should be free of impoundments, with shorelines or watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads.

Recreational Rivers. Recreational River segments are usually readily accessible by road, may have some development along their shorelines, and may have some history of impoundment or diversion.

Descriptions of the five rivers designated by Congress in the 1988 Omnimbus Act are below.

Clackamas River. Forty-seven miles of this river located within the Forest are included in the Wild and Scenic River system. Three segments totaling 20 miles are in the Scenic classification. Another three segments totaling 27 miles are in the recreational classification. The Clackamas River is known for sport fishing and outstanding opportunities for recreational rafting and kayaking. Its visual quality is high, with old-growth timber and mossy cliffs overlooking the water. Camping and hiking opportunities adjacent to the river attract large numbers of visitors.

This river was also designated an Oregon State Scenic Waterway in November of 1988. Because of this, Forest Service direction is that the management plan for this river will be done jointly with the State of Oregon, and the plan will serve both as the Wild and Scenic River Management Plan and the State Scenic Waterways Management Plan.

Roaring River. All 13.7 miles of this river were designated. A 13.5 mile segment of this river is in the Wild classification with an additional 0.2 miles in the Recreational classification. The outstandingly remarkable values of these segments are a primitive character, remote location, and lack of access by vehicle. Its scenery and fisheries also add to the river's importance.

Salmon River. A total of 33.5 miles of this river is included in the Wild and Scenic River system. Of this, the 1988 act states that the upper 25.5 miles will be managed by the Mt. Hood National Forest. The remaining 8.0 miles will be managed by the Bureau of Land Management. On the Forest, two segments in the Recreational classification total 10.5 miles and one segment in the Wild classification totals 15.0 miles. This river's outstandingly remarkable values include the salmon and trout sport fishing, scenery which includes steep canyon walls and waterfalls, and a variety of attractive and sometimes unique vegetation along its banks.

The Forest Service and the Bureau of Land Management are jointly developing one management plan for the entire river.

White River. A total of 46.5 miles of this river are within the Wild and Scenic River system. The 1988 act states that the upper 22.1 miles on the Mt. Hood Forest will be managed by the Forest Service with the lower 24.4 miles managed by the Bureau of Land Management. On the

Forest, 15.6 miles are in the Recreational classification in two adjoining segments, and 6.5 miles are in the Scenic classification in an additional segment. The outstandingly remarkable values of this river include spectacular scenery, unique and varied geologic features, and varied year-round recreation opportunities.

Upper Salmon River.

As with the Salmon River, the Forest and Bureau of Land Management are jointly developing a management plan for the entire river.

Sandy River. 12.4 miles of this river are within the Wild and Scenic River System. Of these, 4.5 miles are in the Wild classification and 7.9 miles in the Recreational classification. The river's scenery has been identified as its outstanding value with views from the river including views of Mt. Hood, bluffs, cliffs and the surrounding forests.

Relationship to the Natural Environment

The designation of these rivers as Wild, Scenic, or Recreational preserves their existing free-flowing characteristics and their outstandingly remarkable values. Those segments in the Wild classification are the most restrictive as far as preserving the environment from the impact of human activity is concerned. The least restrictive is the Recreational limits changes to those river segments as prescribed in the management prescription (see Chapter IV for the Forest Plan). The impact on wildlife and fish should be positive by helping to preserve or enhance their habitats.

Relationship to the Human Environment

Without question, the designation of these five rivers on the Forest to Wild, Scenic, or Recreation categories has two major effects. One effect is to assure the continuation of experiences difficult or perhaps impossible to find anywhere else. On the other hand, each designation is restrictive to some degree, and therefore impacts other Forest opportunities in various ways.

Management Concerns

The goal of management along the Designated rivers is to allow appropriate uses along those rivers while at the same time protecting the free flowing nature of the river and those outstanding values that made the river special in the first place. The Forest is also charged to insure that no activities are allowed within the segments that would adversely affect its given classification of Wild, Scenic, or Recreational.

Because of their importance, specific management plans will be developed for each river that will set forth specific standards and guidelines to guide the management of those rivers. For those rivers that are designated State Scenic Waterways, the management plan will be developed in conjunction with the State of Oregon to insure a coordinated plan that meets the needs of both the State and Federal designations. For those rivers where both the Forest Service and Bureau of Land Management have management responsibilities on different sections of the river, one management plan will be developed to insure the river, its values, and existing and planned uses are considered for the entire river, and not for just portions of the river.

There will be specific impacts from the designation to various activities on the Forest such as limitations on timber harvest, road building, or recreational facility expansion. There may also be some specific limitations to fire suppression activities on the Forest. General standards and guidelines which give guidance on the compatibility of projects within each classification are included in Appendix E of the FEIS.

Eligible Rivers

Background

Public comment to the Draft Forest Land Management Plan identified the need to evaluate other rivers on the Forest to determine if they are eligible as potential Wild and Scenic Rivers. In response to this, the Forest decided to undertake a study of several rivers across the Forest to assess their potential as Wild and Scenic rivers.

Existing Situation

Formal inclusion of a river in the Wild and Scenic river system requires satisfactory completion of several steps in a detailed process. The first step is to determine if the river is eligible for inclusion by assuring that it meets two criteria:

- It must be free flowing.
- With the adjacent land area included, it must process at least one outstandingly remarkable value. Scenic, recreation, geologic, fishery, wildlife, historical/cultural, and ecological are examples of such values.

If a river is found eligible, the river or river segment is classified into Wild, Scenic, or Recreational segments. These classifications are the same as those for the designated rivers described above. They are based on current on-the-ground conditions and how well they match the descriptions repeated below for reference.

- Wild River segments must be free of impoundments, generally accessible only by trail, with watersheds or shorelines essentially primitive and water unpolluted.
- Scenic River segments should be free of impoundments, with shorelines or watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by road.
- Recreational River segments are usually readily accessible by road, may have some development along their shorelines, and may have some history of impoundment or diversion.

The final step in assessing a proposed river is to determine its suitability. This determination provides the basis for recommending designation or nondesignation as a candidate river. Potential candidate rivers recommended for designation as a result of the assessment procedure are subject to a further process of approval and ultimately legislative action by Congress.

For those rivers found eligible, they receive protection of those values which made the rivers eligible in the first place. Management prescriptions direct management activities along those rivers until completion of the suitability studies and the subsequent recommendation for designation or nondesignation. In the suitability studies, those rivers found suitable will be recommended to Congress for Wild and Scenic River designation and will continue to receive protection as potential Wild and Scenic rivers until Congressional action on the recommendation. For the rivers not found suitable, they will be released from protection as Wild and Scenic rivers for other land allocations.

Twelve rivers on the Forest (Map III-20) were identified by the public as having the potential for designation as Wild and Scenic Rivers and were therefore studied to see if they were indeed truly eligible. These 12 rivers are:

- West Fork Hood River
- East Fork Hood River
- Eagle Creek (Clackamas County)
- South Fork Clackamas River
- South Fork Roaring River
- Collawash River
- Middle Fork Hood River
- Zigzag River
- North fork Clackamas River
- Fish Creek
- Oak Grove Fork Clackamas River
- North Fork of North Fork Breitenbush River

Of the rivers listed above, for the rivers or river segments found eligible, they were also classified as Wild, Scenic, or Recreational based on current conditions.

For most of the above rivers, only that portion that was within the designated Mt. Hood National Forest boundary was studied. The exceptions to this are the North Fork of the Clackamas River, the Zigzag River, and the North Fork of the North Fork Breitenbush River where only a small portion of the entire river was off the Forest on private land, or in the case of the North Fork of the North Fork Breitenbush, on the Warm Springs Indian Reservation.

Of the 12 rivers studied, one that was found eligible, the east fork of Hood River, was also studied to determine its suitability. This is summarized in greater detail in the section on Suitable Rivers in Appendix E.

West Fork Hood River. The 5.3 miles of this river that was studied was not found eligible since there were no identified outstandingly remarkable values along the river.

Middle Fork Hood River. All 4.7 miles studied were found eligible with a Scenic classification. The identified outstandingly remarkable values are all related to the Parkdale Lava beds which border the river to the east. The lava beds provide excellent opportunities to interpret unique geologic features and early ecological successional stages and their relation to the forces which helped shape the surrounding area.

East Fork Hood River. Of the 15.9 miles studied, 1.0 mile was not found eligible since it was not considered to be free flowing. 1.4 miles was found eligible with a classification of Scenic. This segment was found to contain an excellent example of a wet meadow complex that is relatively rare throughout the entire Cascade mountain range. The remaining 13.5 miles, classified Recreational, contains important fishing opportunities, relatively unique geologic/hydrologic features, important wildlife habitat for big game calving/fawning, and some relatively good examples of various successional stages.

Zigzag River. 13.5 miles of this river were studied. Of this, the upper 2.9 miles were not found to be eligible since there were no outstandingly remarkable values identified within that segment. The lower 10.6 miles were found eligible because of the presence along the river of the Barlow Road, a historically important part of the Oregon Trail. This segment was classified Recreational.

Eagle Creek. 8.2 miles of this river on the Forest were studied. Of this, the upper 7.1 miles were found eligible with a Wild classification with the presence of prime fish and wildlife habitat along and within the river. The presence of the prime fish habitat also extended into the lower 1.1 miles found eligible and classified Recreational.

Kayaking is a popular river sport.

North Fork Clackamas River. The entire 12.6 mile length of this river was found eligible with the upper 10.0 miles being classified Scenic, and the lower 2.6 miles classified Recreational. This river was found eligible because of the presence of a later winter run Coho salmon that was once found throughout the entire Columbia River system and is now only found within the Clackamas River system.

This river has also been designated as a State Scenic Waterway along its entire length.

South Fork Roaring River. All 4.6 miles of this river were found eligible and classified Wild. The river and its adjoining area contain outstanding undisturbed wildlife habitat. The presence of very high quality native fish habitat, excellent opportunities for primitive recreation, and high quality scenery also added to the river's importance.

Oak Grove Fork Clackamas. Of the 15.1 miles of this river studied, the upper 9.9 miles were found eligible with a classification of Recreational. The outstandingly remarkable value found within this segment was the largest known concentration of the Clackamas Corydalis, Corydalis aquae-gleidae, a plant species that is a candidate for listing as a Threatened species. The lower 5.2 miles below Harriett Dam was not found eligible. This is because it is not considered free flowing since many times during the year all the water in the river is diverted to the Three Lynx powerhouse.

Fish Creek. All 31.2 miles of this river were found eligible with a classification of Recreational. This river also has the late run winter Coho mentioned above present. In addition, fishery habitat potential is considered outstanding and the river is currently part of a nationally significant research project evaluating fishery habitat improvement projects.

Collawash River. All 17.3 miles of this river were found eligible with the upper 11.7 miles classified Scenic and the lower 5.6 miles classified Recreational. Outstanding values for the river include the rare stock of the late winter run Coho mentioned above present throughout the entire length of the river. In the lower segment, there is also the presence of excellent examples of earth flows along the river that lend themselves to very easy interpretation.

North Fork of North Fork Breitenbush. All 4.0 miles of this river were found eligible and classified Scenic. The outstandingly remarkable values include outstanding scenery, a unique combination of geologic features, unique plant communities in different successional stages, and excellent semi-primitive recreation opportunities.

Map III-19 Designated Wild and Scenic Rivers by Segment

Map III-20 Eligible Wild, Scenic, and Recreational Segments

Relationship to the Natural Environment

Protecting these rivers as potential Wild and Scenic Rivers preserves their existing free-flowing characteristics, and their outstandingly remarkable values. As with the designated rivers, those segments classified as wild are the most restrictive as far as preserving the environment from the impact of human activity is concerned. The least restrictive is the Recreational designation. Designation as Wild, Scenic, or Recreational limits changes to those river segments as prescribed in the management prescription (see Chapter IV for the Forest Plan). The impact on wildlife and fish should be positive by helping to preserve or enhance their habitats.

Relationship to the Human Environment

As with the designated rivers, the protection of these 11 rivers in the Wild, Scenic, or Recreational classifications has two major effects. One effect is to assure the continuation of existing experiences along those rivers and segments that could be difficult or perhaps impossible to find anywhere else. On the other hand, each designation is restrictive to some degree, and therefore impacts other Forest opportunities.

Mt. Hood Wilderness: Mississippi Head

Management Concerns

The goal of management along the eligible rivers is to allow appropriate uses along those rivers while at the same time protecting the free flowing nature of the river and those outstanding values that made the river eligible in the first place. Until the rivers found eligible are released from protection as potential Wild and Scenic Rivers, the Forest is also required to insure that no actions take place along the rivers that would lower its given classification of Wild or Scenic.

With the continued protection of those rivers, there may be some specific restrictions of various activities on the Forest such as limitations on timber harvest, road building, or recreational facility expansion. General standards and guidelines which give guidance on the compatibility of projects within each classification are included in Chapter 4 of the Forest Plan.

Wilderness

Background

The Wilderness Act of 1964 described the nature of wilderness:

"A wilderness, in contrast with those areas where man and his own works dominate the landscape, is hereby recognized 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."

The quotation above tells what wilderness is, but not the reason for preserving it. The wilderness experience incorporates a variety of benefits including ecological, scientific, geological, educational, scenic, and historical values. In wilderness, one can experience solitude -- the becoming of one with nature. The wilderness experience is bounded only by each person's individual limitations. It is, for many, a concept or ideal to be preserved even in the absence of direct experience. From this, it becomes clear that Wilderness values can be highly subjective. Benefits can be colored or limited by such factors as one's economic point of view, social philosophy, personal learning, cultural heritage, institutional teachings, and day-to-day associations.

Existing Situation

Six wildernesses on the Forest (Map III-21) occupy approximately 186,200 acres, representing nearly 17% of the total land mass.

The Mt. Hood Wilderness was established by enactment of the Wilderness Act of 1964, and later expanded by the Endangered American Wilderness Act of 1978. In 1984, the Oregon Wilderness Act added Badger Creek, Columbia, Bull of the Woods, and Salmon-Huckleberry as new wildernesses. A small part of the Mt. Jefferson Wilderness, established in 1968, is on the Forest, with the remainder on Willamette and Deschutes National Forests. Each of the three Forests manage that part of the wilderness within its boundaries. The remaining unroaded areas that were not selected for wilderness in the 1984 Oregon Wilderness Bill were released for multiple use management. This could include activities ranging from intensive timber management to semi-primitive non-motorized recreation. The Olallie Scenic Area was identified as a Further Planning Area, and as such may be recommended for wilderness designation during this planning period. The following sketches summarize the general characteristics of each of the Forest's wildernesses.

Columbia Wilderness. The Columbia Wilderness is located on the Columbia Gorge and Hood River Ranger Districts about 30 miles east of Portland, and eight miles west of Hood River. A large wilderness of approximately 39,000 acres, it offers a wide variety of scenic and natural features. On the north side, rugged and steep mountainsides exhibit spectacular basalt cliffs, rocky slopes, and rock outcroppings. As the slopes rise, the terrain turns into slightly uneven, broad plateaus. Visitors can wander past talus slopes, waterfalls, lakes, and mountain peaks. The lower and middle parts of the major slopes fall within the western hemlock zone. The upper slopes are within the Pacific silver fir zone. All three main creeks of the wilderness, Tanner Creek, Eagle Creek, and Herman Creek, flow north to join the Columbia River. Bull Run municipal watershed borders the wilderness to the southwest.

The Columbia Wilderness receives more than 60,000 recreation visitor days (RVD) use per year, making it the highest used wilderness on the Forest. Most of its recreation use consists of hiking, viewing the scenery, and backcountry camping. There are approximately 96 miles of trail within the Columbia Wilderness. One of the best known and most heavily-used trails in the Columbia Wilderness is the Pacific Crest National Scenic Trail, which crosses Benson Plateau in the western portion of the wilderness. Another heavily-used trail is the Eagle Creek Trail which provides access to many popular scenic attractions and camping spots like Punch Bowl Falls, Tunnel Falls, and Wahtum Lake. Two primary access points for entry into the Columbia Wilderness are Interstate 84 in the Columbia Gorge on the north, and Wahtum Lake on the southeast.

Salmon-Huckleberry Wilderness. The Salmon-Huckleberry Wilderness is located on the Zigzag Ranger District about 15 miles southeast of Sandy, and 55 miles southeast of Portland. At 44,600 acres, the Salmon-Huckleberry is slightly larger than the Columbia Wilderness. The majority of the area is covered with trees. Volcanic plugs, pinnacles, cliffs, and steep and sharply cut slopes add to the ruggedness of this area. Most of the lower slopes are within the western hemlock zone with a transition to the Pacific silver fir zone on the upper slopes. The Salmon River and Eagle Creek, with their tributaries, form the two main watersheds of the Salmon Huckleberry Wilderness.

The Salmon-Huckleberry Wilderness receives an estimated 11,000 RVDs per year. This is the lowest recreation use of any Wilderness on the Forest. Its main attraction is the Nationally designated Wild and Scenic Salmon River and the associated Salmon River National Recreation Trail. This trail follows the river and offers a variety of scenic attractions including views of waterfalls within the Salmon River Gorge. The remaining recreational use of the area occurs widely over the western part of the Wilderness. This portion contains such trails as Eagle Creek Trail, Wildcat Mountain Trail, and Huckleberry Mountain Trail.

Another trail, the Hunchback Mountain Trail, generally follows the northeastern boundary of the Wilderness. State Highway 26 and Salmon River Road, State Highway 224 and Abbot Road, and Forest road #2613, which goes through Sherar Burn, provide the main access points to the Wilderness.

Badger Creek Wilderness. The 24,000-acre Badger Creek Wilderness lies on the Barlow Ranger District about 45 miles southwest of The Dalles and 67 miles east of Portland. Glacial features such as steep-walled, wide U-shaped valleys contribute to the extensive geological and ecological diversity of this area. The upper portion of the Badger Creek drainage offers the most dramatic features of the Wilderness. Upper reaches of the major watershed fall within the mountain hemlock zone. Eastern areas are in the ponderosa pine zone which includes large areas of Oregon white oak and grasses This part of the Wilderness is usally warm during the summer. Lookout Mountain is the highest point in the Wilderness, and with the ridge to the east supports a subalpine biological community. A high elevation community of grasses and herbs grows at High Prairie.

Recreation use of the Badger Creek Wilderness averages about 14,000 RVDs per year, making it one of the lightest used areas. Its 45 miles of trails includes the Badger Creek National Recreation Trail. The crest of Lookout Mountain provides commanding views of the Cascade Range and the eastern high desert country. The area encompassed by the Badger Creek Wilderness was utilized in aborinal times by a number of different native groups for the purposes of root digging, berry picking, and hunting. Within the last few hundred years, the native tribes of the Wasco, Tenino, and Molalla have made use of the area. Badger Creek Wilderness has three major access points: Forest roads #44 and #4410 via State Highway 35; forest roads #27 and #2710 via U.S. Highway 97; and forest roads #48 and #4811.

Map III-21 Wilderness and Unroaded Areas

East boundary of Badger Creek Wilderness.

Mt. Hood Wilderness. The Mt. Hood Wilderness contains 47,100 acres which surrounds Mt. Hood. This Wilderness stretches from the Zigzag Ranger District into the Hood River District, and is about 23 miles east of Sandy and 45 miles east of Portland. The wide range elevation is extreme from 2,000 feet at its lowest point to 11,235 feet at the summit of Mt. Hood, creating a truly demanding topography. Permanent glaciers cloak the top of Mt. Hood, and glacial-fed streams, high lakes, and alpine meadows acclaimed for their late summer tapestry of bright wildflowers, surround the mountain peak. The variety of elevation and climate has produced equally varied biological communities. Western hemlock zone communities grow in lower elevations, giving way to Pacific Silver fir, mountain hemlock, and subalpine forests as the elevation increases, finally reaching the alpine zone in the uppermost reaches.

This is a heavily used Wilderness averaging about 56,075 RVDs per year. The Mt. Hood Wilderness contains 112 miles of trails including the Pacific Crest National Scenic Trail which traverses the Wilderness. Elk Meadows, Ramona Falls, Elk Cove, Paradise Park, and the Timberline Trail offer special attractions and have the greatest recreation use. Various high lakes dotting the foothills of Mt. Hood also attract many visitors. In recent years, overuse of some of the most popular areas has caused some deterioration, resulting in more restrictive Wilderness management.

Two primary access points include Forest roads #18 and #50 via U.S. Highway 26, and forest road #3555 and #3512 via State Highway 35. Two land inholdings are located within the Wilderness: a 600-acre parcel owned by Clackamas County, and a 40-acre parcel owned by a private individual.

Mt. Hood Wilderness: southwest side.

Bull of the Woods Wilderness. The Bull of the Woods Wilderness is located on the Estacada Ranger District about 68 miles southeast of Portland and 65 miles east of Salem, and contains 34,900 acres. 26,400 of these acres are the responsibility of Mt. Hood National Forest, the remaining 8,500 acres are administered by the Willamette National Forest. The steep, mountainous slopes which make up the Wilderness are deeply cut by a number of streams. These streams include the major headwaters of the Collowash, Breitenbush, and Little North Fork Santiam rivers. Dense stands of giant trees cover most of the slopes. The largest part of the area falls within the western hemlock forest zone. The mid-slope areas fall in the Pacific silver fir forest zone, and the upper ridges in the mountain hemlock forest zone. More than a dozen lakes can be spotted throughout the Wilderness. They are isolated from one another by steep, high ridges, and are at least an acre in size. These lakes support small populations of resident fish.

An estimated 14,700 RVDs consisting primarily of hiking, camping, and fishing are recorded per year within the Bull of the Woods. Most of the recreation occurs along the 35 miles of recreation trails. The Bull of the Woods Lookout is one of the most heavily used areas in the Wilderness because it commands a superb, 360-degree view of the surrounding territory. Mine shafts, old pieces of equipment, and other man-made features are found within the Bull of the Woods; reminders of a once active mining history.

Key access points for the Bull of the Woods Wilderness include Forest roads #46 and #2209 via State Highway 22, and forest roads #63, #6430, #6341, and #70 via State Highway 24.

Relationship to the Natural Environment

A central purpose of establishing Wilderness is to preserve the natural environment. The requirements of the Wilderness Act, previously cited, combined with the Pacific Northwest Region's policy of nondegredation of Wilderness, assures conditions in which natural processes are left to function without interference from human beings (FSM 2322.03 R-6 Supp 4/87). This does not mean human activities have been completely eliminated from Wilderness. All Wildernesses receive some recreational use, with concentrated uses in specific locations. Sometimes, concentrated use of Wilderness can cause deterioration of the resource. Heavy foot traffic by hikers can compact the soil and trample vegetation. Camping can exaggerate those impacts. High elevation areas and areas on the drier east side of the Cascades are generally less resilient to soil and vegetation disturbances than areas at lower elevations and areas on the west side respectively. This is due to the slower soil forming processes and shorter growing seasons at high elevations and dry east-side areas. As a result, once the soil or vegetation is damaged, it takes longer for recovery.

The suppression of natural fires has had, and continues to have an impact on Wilderness. Natural fire has played an integral role in the development and maintenance of Wilderness vegetation. As explained earlier in this chapter, all types of vegetation on the Forest developed subsequent to fires of natural origin. The frequency and intensity of fire has, to considerable extent, determined the species composition of vegetation. Some plants are more resistant to fire than others, low intensity fire will kill some plants, but not others; therefore, when natural fire is removed from the ecosystem through suppression strategies, different types of plants and plant communities develop in the area. This results in a different wilderness landscape and character than would have normally existed. For example, many meadows were once free of conifers due to frequent, low intensity fires; now these same meadows may have established tree cover. This is due in part to the elimination of natural fire through fire suppression. Therefore, the continued suppression of fire in Wilderness can further changes to the vegetative landscape, and Wilderness experience.

Relationship to the Human Environment

In an earlier passage we touched on the subjective, intangible, yet highly satisfying and important benefits people can reap from the preservation of Wilderness. A stay in Wilderness can provide a sense of adventure, of renewed respect for natural beauty, the rarity of complete solitude, and uninterrupted moments of reflection. Many people find that coming together with untrammeled nature, leaving behind all reminders of civilization, can help the spirit to soar. Aside from their subjective, individual benefits, Wilderness also provides opportunities for the study of biological and physical phenomena which otherwise would not be available.

Management Concerns

Estimating Demand. This is a fundamental management concern which has been complicated by the establishment of four new Wildernesses. While estimates of total use within a Wilderness are known, accurate estimates of use in specific areas of the new Wildernesses have yet to be collected. There is little data relating to the amount, location, length of visits, and type of Wilderness recreation uses taking place on the Forest. To date, Forest management has relied on historical data for some locations, and the professional judgments of local managers. Recreation-use estimates under this process can be used for establishing general trends only. The accompanying table summarizes the estimated, current use of five Wilderness areas. The table also projects the anticipated future demand for wilderness (Primitive ROS) in total. Accurate estimates of demand by individual wilderness area are not available.

Table III-44 Wilderness Recreation Demand in RVD's/Year[2]

Wilderness	Estimated Carrying Capacity[1]	Current Use	Demand by Year 2040
Columbia	29,827	60,600	
Badger Creek	19,155	14,000	
Salmon-Huckleberry	33,352	11,000	
Bull of the Woods[3]	20,530	14,700	
Mt. Hood	36,118	56,075	
Subtotal	138,982	156,375	
Mt. Jefferson	4,948	10,125	
Totals	143,930	166,500	899,000

[1] *Wilderness carrying capacity based on the assumption coefficient of 1.0 RVD/ACRE/YEAR for Semi-Primitive Trailed WRS (Wilderness Resource Spectrum) zone, and 0.75 RVD/ACRE/YEAR for Primitive Trailed WRS zone.*

[2] *1983 Recreation Information Management (RIM) Estimates, Report No. 2300-1*

[3] *Mt. Hood National Forest portion of use only. Refer to Willamette National Forest for more complete information.*

According to the estimates in Table III-44, (which are based on even distribution of use), the Forest falls short of meeting present and future demand, especially in the Mt. Hood and Columbia Wildernesses. However, actual use patterns magnify the problem. Most recreational use of Wilderness occurs at popular destination points or along main access trails, and some resource deterioration occurs at the most heavily used destinations. The problems have identified the need to collect reliable wilderness-use data for each of the areas. The most heavily used wilderness locations are listed in Table III-45.

Table III-45 Most Heavily Used Wilderness Destinations

Mt. Hood Wilderness	Salmon-Huckleberry Wilderness	Columbia Wilderness	Bull of the Wilderness
Burnt Lake	Rolling Riffle	Wy'East Camp	Bull of the Woods
Ramona Falls		Wahtum Lake	Lookout
Eden Park		7 1/2 Mile Camp	Pansy Lake
Elk Cove		Tunnel Falls	
Paradise Park		Eagle Creek Trail	
Mt. Hood Summit			
Elk Meadows			
Cooper Spur			

Current Management Policies. Basic management policies comply with the requirements of the Wilderness Act of 1964 and the nondegradation policy for the management of Wilderness within National Forests established by the Pacific Northwest Region. The general orientation of the Mt. Hood Wilderness is toward regulating specific recreation activities such as camping or building fires. All Wilderness administration on the Forest depends heavily on volunteer Wilderness rangers. In the future, a specific Wilderness Implementation Plan will be developed for each Wilderness Area. These plans will address issues like prescribed fire, air quality, management of use and overuse, trail development, signing, outfitter guides and special use permits, and grazing.

Under existing policies, timber harvest in Wilderness is prohibited. Geothermal sites can be developed only under strict standards which may make development difficult. Prospecting for minerals in Wilderness areas is permitted but no new patents or claims can be filed. No existing patented claims are in effect for any of the Forest Wilderness areas.

Wilderness Resource Spectrum as a Management Concept. Standards and guidelines for managing Wilderness within the nondegradation policy have been developed under the Wilderness Resource Spectrum (WRS) concept. In the Pacific Northwest Region, the WRS classification system has been adopted to establish a variety of settings to meet Wilderness management objectives. The WRS classification applies specifically to Wilderness management and should not be confused with the Recreation Opportunity Spectrum classification system. WRS classifications are determined by measurable criteria which describe the social, biological, and physical characteristics of the area. Three primary zones are:

Primitive Trailless. This zone offers the maximum possible solitary Wilderness experience. To qualify for this designation, the zone must be large enough to allow at least two days of cross-country travel without crossing a constructed trail. No more than one encounter with another user may be expected. The Forest does not contain this class of Wilderness zone.

Primitive Trailed. This zone offers the most solitary experience to be found on the Forest. The only facilities permitted are those needed to protect the environment. In practice, this means the presence of trails and a limited number of signs only. A user may expect to encounter no more than six other parties per day during 80% of the use season.

Semi-Primitive Trailed. This zone offers somewhat less solitary Wilderness experience than the Primitive Trailed. Activities to control degradation of the ecological and social values of the Wilderness are evident. Limited development, including toilets, are permitted. The number of encounters with other users is not expected to exceed 12 parties per day during 80% of the season.

Transition. In addition to the primary zones, the Mt. Hood National Forest has established a Transition Zone. Although this zone totals only 3,991 acres on the Forest, encounters with other users in some areas exceed those specified for the Semi-Primitive Trailed zone, and make it desirable to identify areas where the heaviest use of the Wilderness takes place. Higher intensities of Management activity in transition zones are evident. More signs are in the zone, and trails may be constructed to higher standards. Encounters with other users is expected to be 18 or less per day during 80% of the season.

Table III-46 summarizes the existing WRS classifications by acres for all Wildernesses on the Forest.

Many Wilderness users demand access points, facilities, and other developments which are inconsistent with the original purpose of Wilderness. This has created an important management concern. In response to the situation, the Forest intends to develop a public education program about the intent of the Wilderness designation, the use of WRS intensity zones, and the types of recreational activities which may be expected in a Wilderness.

Table III-46 Existing WRS Classification Zones[1] In Acres[2]

Wilderness	Total Acres	Primitive Trail-Less	Primitive Trailed	Semi-Primitive Trailed	Transition
Columbia	38,885	0	36,233	1,615	1,037
Badger Creek	24,295	0	20,560	3,735	0
Salmon-Huckleberry	44,600	0	44,319	211	70
Bull of the Woods	26,385	0	23,422	1,581	1,382
Mt. Hood	47,100	0	43,929	1,669	1,502
Mt. Jefferson	4,948	0	0	4,948	0
Total Acres	186,213	0	168,463	13,759	3,991

[1] *WRS classification guided by Forest Service Manual 2320-1 Region 6 Supplement 56. Classification is based on the degree of solitude, the amount of Forest Service administration, the type of trail system available, and the anticipated camping experience.*

[2] *1984 Data.*

Roadless Areas

Background

In January 1979, approximately 221,800 acres in 11 areas were identified as RARE II Roadless areas. RARE II was a comprehensive process begun in June 1977 to identify unroaded and undeveloped land areas in the National Forest System. RARE II also determined their general uses for Wilderness, and other resource management and development. The process was completed in 1979.

The Roaring River and Larch areas were unroaded, but were not listed as RARE II Roadless areas. They were not considered in the RARE II evaluation, because both had been evaluated in a previous planning process called a unit plan.

In passing the Oregon Wilderness Act of 1984, Congress created new Wildernesses out of five of the RARE II Roadless Areas. In each case, the Wilderness area formed was smaller than the unroaded area. Table III-47 shows the RARE II Roadless area, the Wilderness formed, and the unroaded acres remaining. The remaining acres were released to be managed for multiple use, in accordance with land management plans. Multiple use includes non-wilderness recreation settings, as well as intensive timber harvest.

Table III-47 Roadless Areas, Wilderness, And Remaining Acres

Rare II Roadless Area	Wilderness Formed	Remaining Acres
Badger	Badger Creek	1,700
Bull of the Woods	Bull of the Woods	11,400
Eagle	Columbia	16,800
Mt. Jefferson Additions	Mt. Jefferson	300
Salmon-Huckleberry	Salmon-Huckleberry	20,300

Existing Situation

After the passage of the Oregon Wilderness Act of 1984, 12 areas large enough to be managed for unroaded values remained. They comprise about 118,350 acres. The following changes should be noted: Mt. Jefferson Additions (RARE II area 0601), had 900 of its 1,200 acres added to Mt. Jefferson Wilderness. The 300 acres remaining were incorporated into the Olallie unroaded area. Table III-48 shows 7,770 acres in the Olallie/Mt. Jefferson area. These have been treated in the analysis section of the RARE II Olallie Further Planning Area. The Big Bend Area (approximately 10,200 acres) is located within the Bull Run Watershed. Consequently, this area and corresponding acreage is not tracked throughout the analysis process. Discussions in the R.O.D., Summary, and Chapter II and IV of the FEIS refer to only 11 areas instead of 12.

The 1984 Wilderness Act stated that *"The Department of Agriculture shall not be required to review the wilderness option prior to the revision of the plans, but shall review the wilderness options when plans are revised. . ."* The exceptions are lands remaining in the future planning status, such as the Rare II Olallie Further Planning Area. The Rare II Olallie Further Planning Area has been evaluated for a range of management objectives, which includes wilderness. The other areas determined to have unroaded values have been evaluated for a range of management alternatives in this document.

Complete descriptions and histories, including the Wilderness potential of each of the 12 remaining unroaded areas, may be found in Appendix C. Appendix C provides detail about the environmental consequences of designating these areas to allocations other than wilderness. These consequences are also described in Chapter II. Unroaded areas and their acreages are listed by Ranger District in Table III-48. Map III-21, in the Wilderness section of this chapter, displays the Forest's unroaded areas.

Table III-48 Roadless Areas By Ranger Districts

Roadless Area Name	Location by Ranger District	Present Size in Acres
Olallie/Mt. Jefferson	Clackamas	7,770
Mt. Hood Additions	Hood River and ZigZag	12,940
Wind Creek	ZigZag	5,440
Badger Creek	Barlow	850
Twin Lakes	Bear Springs	6,050
Salmon-Huckleberry	Estacada and ZigZag	17,650
Lake	Columbia Gorge and Hood River	1,350
Eagle	Columbia Gorge	17,270
Larch	Columbia Gorge	13,120
Bull of the Woods	Estacada	8,660
Roaring River	Estacada	27,250
Total Areas: 11		
Total Acres Remaining		118,350

Unroaded areas are being managed under the current District Multiple Use Plans, and completed unit plans. This will continue until the Forest Plan is completed, and the remaining unroaded areas are allocated to specific uses. These plans allow timber harvesting in most of the existing unroaded areas.

Relationship of Unroaded Areas to the Natural Environment

An area kept in its natural, unroaded state will maintain it's vegetation, wildlife, soil, hydrologic, and atmospheric conditions. These natural conditions can change, if the area is subjected to a large scale disturbances such as catastrophic fire, windstorm, insect attacks, or disease outbreak.

When management activities are kept out of an area, human influence and activities tend to diminish. Under these conditions, educational opportunities for the study of ecological processes gradually increases. However, uncontrolled insects or diseases can slowly spread to adjacent lands. Another indirect effect of keeping an area in a natural state is a gradual build up of fuels,and reduced vigor of timber. This increases the risk and severity of fires, as well as attacks by insects and disease.

In the long term, unroaded areas tend to benefit wildlife species that require natural habitats. However, early-stage vegetation is required by some species. These species may not benefit from late stage vegetation left in a natural conditions. Habitats of threatened, endangered, or sensitive species would be protected by unroaded lands. Unroaded areas capable of producing old growth would benefit wildlife species and recreation opportunities dependent on old growth.

Timber harvest and road building can adversely affect wildlife habitat. As unroaded areas are developed, vegetative cover for hiding and warmth (thermal cover) are reduced. Species associated with old growth are also reduced. The increased forage resulting from timber harvest favors species that require younger stages of cover. Harassment of wildlife species may increase as roads are built into unroaded areas.

Relationship of Unroaded Areas To The Human Community

The issue of unroaded areas, and their eventual fate, has been one of great public concern. The concerns about some unroaded areas were settled by the 1984 Wilderness Act. The Forest Plan will designate the others for a number of possible uses.

There is a wide range of opinion on the use of unroaded areas. The extremes vary from making them totally available for timber harvest or other intensive management, to maintaining them all for unroaded recreation. There will be gains and losses in whatever choice that is made. Timber is a valuable commodity, and it's harvest provides needed employment. Unroaded areas are a valuable resource, and opportunities to explore the backcountry provide needed solace to the spirit. The remaining unroaded areas can provide a range of opportunities for recreation use, and benefit various species of wildlife and plants.

The existing unroaded areas provide opportunities for semi-primitive and primitive dispersed recreational experiences. These areas also provide opportunities to reduce the number of people using Wilderness, by dispersing people into the unroaded areas. This reduces the impacts on heavily used Wildernesses.

Unroaded areas managed under prescriptions that do not retain unroaded characteristics can lose their semi-primitive and primitive dispersed recreation opportunities. This loss usually leads to recreation activities based on motorized vehicles. The development of these areas for timber harvest may remove the opportunity for future generations to manage these areas in a natural state, such as wilderness.

The short and long-term visual appearance of unroaded areas changes as they are developed. As a result, visitors begin to experience a change in the Forest's structure and appearance. This appearance changes from larger mixed age stands, to smaller more uniform stands with less dead and down material.

Special Interest Areas

Background

The purpose of designating Special Interest Areas is to protect and provide interpretation of unique geological, biological, and cultural areas for education, scientific and public enjoyment.

The management objective for Special Interest Areas is to keep them substantially in their natural condition. Where appropriate, they should be operated principally for recreational uses. Certain other uses may be authorized at the discretion of the officer making the classification. Area boundaries should be easily recognized, readily enforced, and should include all values to be protected. Special Interest Areas of less than 100,000 acres may be approved by the Regional Forester. Areas larger than 5,000 acres are reviewed by the Chief of the Forest Service. These areas are classified and managed under the Code of Federal Regulations (CFR294.1)

Sixteen new (including two expansions) Special Interest Areas have been considered for addition to the five existing Special Interest Areas (Map III-22). The list of potential Special Interest Areas was developed from public input to the draft FP & EIS, proposed areas from past planning documents and from National Register properties that include substantial land bases. SIA's which had been previously proposed, but never designated, were taken from old Recreation Area plans.

Existing Situation

Barlow Tollgate. This small area is less than one acre (.8 acres) and is located on Highway 26 in the Zigzag Ranger District. It includes an interpretive site, a tollgate that has been reconstructed to duplicate the original Barlow Road tollgate, and two maple trees which stood on the site when the tollgate was used from 1879 to 1915. The Barlow Road was opened to emigrant travel in 1846.

Columbia Gorge Old Wagon Road. This 65-acre area in the Hood River Ranger District includes part of the original Dalles-Sandy wagon road built by Oregon in the

1870's. A section of the road has a rock retaining wall with several rock ovens along the talus slope of Shellrock Mountain.

Barlow Road Tollgate.

Little Crater Lake. This 4.6 acre site is a geological wonder located 16 miles south of Mt. Hood. It is about 80 feet in diameter, and has sheer, vertical walls which descend to a depth of 45 feet. The lake is circular and resembles a crater, but its origin is due to a fault structure. The fault acts as a passageway for water that is clear enough to allow visitors to see far down into the lake. The deep blue color of the lake, its meadow setting, and the adjacent campground provide a variety of recreational and interpretive opportunities.

Olallie Lake. This 10,800 acre site is located in the high country at the south end of the Forest. Historic glaciation of the location created more than 200 lakes and ponds. Olallie Lake is the largest in the area. Several campgrounds and a resort area are available. A guard station built in the 1930's by the Civilian Conservation Corps is still used by the Forest Service. The Olallie lakeshore, and a number of sites in the unroaded hiking areas of the backcountry, provide striking views of Mt. Jefferson.

Oneonta Gorge. This 11.5 acre narrow canyon is located in the Columbia Gorge. Oneonta Creek flows through the high basalt cliffs of this canyon, which range in height from 75 to 175 feet high. Oneonta Falls dominates the head of the canyon. The small gorge contains fossils, and petrified casts of the remains of an ancient forest. This forest was buried eons ago by basalt flows. It is one of the most diverse habitats for rock dwelling plants in the Columbia Gorge; more than 100 species currently grow there.

These five existing Special Interest Areas occupy approximately 10,880 acres.

Potential Special Interest Areas

Stringer Meadows. This area of approximately 230 acres contains a wet meadow complex that is very unique for its size and type throughout the central Cascades. The Stringer Meadows area is a basin with many intermingled tree islands around several diverse wetland areas. Most other subalpine meadows in the area are large openings that are surrounded by large forested tracts, or large basins with a few scattered tree islands. The great ecological diversity found within this meadow complex provides valuable habitat for several plant and animal species, and provides many scenic views.

Barlow Road. This road of historic significance traverses 6,550 acres of the Barlow, Bear Springs, and Zigzag Ranger Districts. The travel route was first opened as a toll road to emigrant travel in 1846. The proposed acreage includes the visual foreground along the road (visual viewshed). It is a recognized overland segment of the famous Oregon Trail, and is now part of the Oregon National Historic Trail designated by Congress in 1978. Features of special interest are the routes followed by the early settlers, and the historic sites along those routes. The Barlow Road has been determined eligible for the National Register of Historic Places as an historic district. Formal nomination is underway.

Larch Mountain. Larch Mountain is a 30 acre site on the Columbia Gorge Ranger District. This proposed area offers visitors a day-use picnic area, and a magnificent view of the surrounding countryside. These views can be enjoyed from a scenic outlook located on an andesite dike at Sherrard Point. The Bull Run drainage area, Mt. Hood, and the surrounding volcanic peaks of the Cascade Range (including Mt. Rainier) are all visible from Larch Mountain. Visitors will also enjoy the colorful early logging history of this area.

Roaring River. The area totals 19,320 acres in a stretch of the Roaring River canyon on the Estacada Ranger District. The area includes a spectacular narrow gorge lined with sheer basalt cliffs and talus slopes. Upstream, the gorge widens to an undisturbed river valley, with timber sweeping up the steep slopes. It is unroaded and provides hikers with a choice of several trails. Roaring River is a designated Wild and Scenic River Roaring River, which adds to the special character of this area.

Map III-22 Special Interest Areas

Table III-49 Special Interest Areas

Special Interest Area	NC	A	C	E	F	H	I	Q (Preferred)
Cloud Cap-Tilly Jane	X	X	X	X	X	X	X	X
Barlow Tollgate	X	X	X	X	X	X	X	X
Columbia Gorge Old Wagon Road	X	X	X	X	X	X	X	X
Little Crater Lake	X	X	X	X	X	X	X	X
Little Crater Lake Expansion	X	X		X	X	X	X	X
Olallie Lake	X	X		X	X			X
Olallie Lake Expansion				X	X			X
Barlow Road				X	X	X	X	X
Larch Mountain				X	X	X	X	X
Roaring River				X	X	X	X	X
Lost Lake				X	X	X	X	X
Bagby Hot Springs				X	X	X	X	X
Sugar Pine				X	X	X	X	X
Squaw Meadows				X	X		X	X
Parkdale Lava Beds				X	X	X	X	X
Old Maids Flat					X	X	X	X
Clackamas Lake					X	X	X	X
Stringer Meadows						X		X
Mill Creek Buttes	X	X				X		
Oneonta Gorge	X	X	X	X	X	X	X	X

Mitchell Flats. This 1,150 acre area is located on the Clackamas Ranger District. The proposed site offers numerous hiking and cross-country ski trails, and has both scenic landscapes and wildlife viewing opportunities.

Lost Lake. This area of 1,620 acres is well known for its view of Mt. Hood, and includes Lost Lake and the surrounding basin. The campground, resort, and picnic area on the east shore are privately operated at this time under a special permit. The area is at the west end of the Hood Ranger District.

Bagby Hot Springs. This 1,410 acre site is located near the Hot Springs Fork of the Clackamas River, 40 miles south of Estacada. The proposed area includes the access trail and the development surrounding the hot springs. This consists of cedar tubs, dugout log tubs, individual bath houses, and a cabin. A ranger station built in the 1910's is now used as a storage cabin. The Friends of Bagby, a private group, has maintained the site. Special features of this area include the thermal hydrogeology, microhabitat for plants, historical buildings, and the unique recreational opportunities of the hot springs.

Sugar Pine. This 40 acre site contains a unique stand of several old growth sugar pines, and is the northernmost grove of this tree species. The pines are isolated from the remainder of their range which runs from southern Clackamas County to Baja, California. This botanical area is located in the southern section of the Clackamas Ranger District.

Little Crater Lake Expansion. This 340 acre proposed area includes a campground and a meadow adjacent to the previously designated Little Crater Lake Special Interest Area. The meadow offers wildlife observation, interpretation of local ecology, and other types of recreation. Its ecologically sensitive, high elevation meadows are among the few meadows of this type on the Forest. The area is on the Bear Springs Ranger District.

Little Crater Lake

Squaw Meadows. This 940 acre proposed area is an impressive example of a cirque basin created by a glacial scour. Other special features include ecologically sensitive high-elevation meadows. This type of habitat is needed by some species of wildlife. Archeological and historical sites are also present within the area's boundaries. It is located at the north edge of the Roaring River drainage, on the Estacada Ranger District.

Parkdale Lava Beds. These lava beds of 830 acres within the Hood River Valley resulted from a relatively recent (approximately 250 years ago) vesicular basalt intercanyon lava flow. The beds are an excellent example of an "ah-ah" type lava flow typified by rough, jagged, spinose, and cindery surfaces. Large deposits of stream and lake sediments are found in the beds. These indicate that the Middle Fork of the Hood River was probably dammed by the lava, because the river has now cut a channel along the western edge of the lava flow. Vegetation throughout the area is extremely varied. Areas in the south end are very brushy, with small conifers. The extensive areas in the north end have no vegetation. The area offers a range of recreational and interpretive opportunities.

Olallie Lake Expansion. This proposed addition would add 1,700 acres to the Olallie Lake Special Interest Area by expanding its northern boundary. On the south end of the Forest, it includes a part of the Pacific Crest Trail, a small lake and surrounding meadow, and some interesting geological features.

Clackamas Lake. This 240 acre area is located on the Bear Springs Ranger District. It includes the former Clackamas Lake Ranger Station with CCC-era architecture, the Miller cabin site, and meadow/forest transition vegetation. The Ranger Station is outstanding because its exterior and interior architectural integrity has adhered to the construction style used by the Civilian Conservation Corps in the 1930's. The area was listed on the National Register in 1979.

Cloud Cap - Tilly Jane. This 1,520 acre area on the Hood River Ranger District contains sites and features from a bygone recreational era. The era was the period of early uses that began in 1885, and ended in the late 1930's. This was the time when recreation, such as mountain climbing, took place on the northern slopes instead of today's more popular southern slopes. The area includes three roads that traverse up the north side of Mt. Hood, and continue into the area from below the following sites: Cooper Spur, Cloud Cap Inn,* Cooper's tent campsite, the Inn's stable site, the Snow Shoe Club's cabin, two old cabin sites, a CCC camp, Tilly Jane Forest Camp, Tilly Jane Guard Station, an American Legion camp and amphitheater, and the CCC Ski Warming Hut. It was listed on the National Register in 1979.

Mill Creek Buttes. This area of 1,150 acres includes the twin peaks of Mill Creek Buttes, and is situated in the City of the Dalles Municipal Watershed on the east side of the Barlow Ranger District. With elevations ranging from 4,000 to almost 5,000 feet, the buttes overlook the surrounding forested valleys, and provide panoramic views.

Old Maids Flat. This 1,690 acre area along the Nationally designated Wild and Scenic Sandy River is a unique exhibit of recent volcanic flows. Old Maids Flat formed when a series of mudflows dammed the Muddy Fork and Lost Creek. The most recent mudflow was estimated to occur in the mid 1790's. Due to the lack of soil formation on the ground surface, and dry subsurface conditions, a distinctive "droughty-soil" vegetation community exists today. Old Maids Flat is covered by a thick carpet of moss and lichen set with stunted pines and fir, scattered clumps of rhododendron, and huckleberry. This combination of conditions provides a special setting for recreation, as well as sites for the study and interpretation of geologic and ecologic history (Cameron and Pringle, 1987).

The potential Special Interest Areas total approximately 38,680 acres. The accompanying map shows the locations of existing as well as potential Special Interest Areas.

Relationship to the Natural Environment

An area designated as a Special Interest Area must be managed by the Forest to substantially retain its natural condition. The special designation generally emphasizes old-growth forests, and wildlife species dependent on old growth. The development of other resources will not be allowed to materially impact the unique features which qualified the area for special designation. These include historical, archeological, geological, botanical, zoological, paleontological, or comparable characteristics that are unique or scenic.

Relationship to the Human Environment

Special interest areas offer a wide variety of recreational opportunities to visitors. These range from unroaded trail hiking, to developed resorts. These areas must be managed to satisfy the recreational needs of a cross-section of people, although a limited number of other uses may be permitted. Dispersed or developed recreation is likely to be the main focus of these areas. The emphasis will vary with the special features of the site.

The use of some parts of designated areas may be restricted to the public, to enhance the protection of special features. These restrictions could prohibit downhill ski development, or construction of new campgrounds. Concentrated recreation use, loading ramps, stock tanks, fences, and holding pens should be located away from the special features of the area. If livestock range conflicts with the observation of wildlife, wildlife will take priority. Improvements that enhance public enjoyment of the environment by increasing wildlife viewing opportunities may be initiated.

Management Concerns

The goal of Special Interest Area management is to protect important historic, cultural, and natural components of our national heritage. Public use and enjoyment of these areas should be encouraged, when deemed appropriate. Public use of these areas for recreation, study, and pleasure is restricted only by the need to protect their special features. An implementation plan for each area will provide direction for specific protection measures, acceptable development and enhancement programs, prescribed fire, and other appropriate uses and activities. Since these areas are special or unique by definition, individual implementation plans which conform to Special Interest Area standards and guidelines must be developed for each site. Management plans for existing Special Interest Areas must be updated to reflect current management concerns, as well as, new opportunities which may develop under the Forest Plan.

The impact of Special Interest Area designations on other resources of the Forest is a matter of significant management concern. Timber harvest, for example, would be prohibited in these areas; an exception would be harvest for salvage or disease-control programs that are needed to protect special features. Road and facility development would probably be restricted to areas of existing developed recreation uses. Some existing roads and facilities may be closed or removed if they impair the areas' special features. New roads and facilities may be needed to improve access to the special features of an area. The trail systems in these areas may be expanded or improved. Also, structural and non-structural habitat improvements are permissible, with certain provisions. They must not detract from the special features of the area, or cause extended disruption of recreation use.

Management of fire suppression will be limited to methods which have the least impact on the special features and landscape of designated areas. If natural fire has been an important factor in the past ecology, natural fires may be allowed to burn within the prescription of the areas' prescribed fire implementation plan. Fuel loads may need to be reduced near areas of site improvements and facilities, to reduce the risks of fire damage.

Uses which impair the special features of a Special Interest Area or cause long term disruption of recreation use may be prohibited. Therefore, these areas may be withdrawn from mineral entry and mining laws, but not from mineral leasing laws. Hydroelectric development which affects stream flow will be strongly discouraged, because the free flow of rivers and streams is an important element of natural environments.

Visual Resources Management

Background

The Forest provides the public with recreational benefits, as well as products like wood and water. Beautiful scenery may be the benefit enjoyed by the largest number of people. With more than a million acres in the heart of the Cascade Mountains, the Forest daily offers a number of magnificent scenic vistas, a snowcapped mountain, spectacular waterfalls, crystal streams, blue lakes, and meadows of many-colored flowers. These visual resources attract tourists from all parts of the nation, as well as nearby residents.

Personal judgement determines the beauty and desireability of a landscape. A view that is breathtaking to some people could be boring to others. However, landscape architects have been able to identify recurring qualities in scenes that

most people consider to be attractive. After allowing for differences in tastes, they have developed a system which classifies landscapes according to their desirability. The system is called the Visual Management System, or VMS, and is used in the Forest's visual resource management (Map III-23a). In the VMS:

Variety. Variety is an attractive mixture of features like landforms, waterforms, rock formations, and/or patterns of vegetation. This concept is used in establishing three classes of variety. Variety Class A are landscapes of unusual or outstanding variations. At the other extreme, Variety Class C landscapes tend toward monotony.

Sensitivity Level. Sensitivity level is a particular degree or measure of viewer interest in the scenic characteristics of the landscape.

Distance Zones. Distance zones are areas of landscapes determined by specific distances from the observer. These zones are used as a frame of reference in which to discuss landscape characteristics or human activities.

Visual Quality Levels. Visual quality levels are the output of the VMS inventory process, and are based on physical and social characteristics (Variety Class and Sensitivity Levels) of the Forest. Each level refers to the degree of acceptable change from its natural condition. When Visual Quality Levels are adopted by forest management staff through the planning process, they become Visual Quality Objectives.

Preservation: Limited to ecological changes.

Retention: Retains a predominantly natural landscape. Human activities are not evident to casual visitors.

Partial Retention: Evidence of human activities is permissible, but is subordinate to characteristics of the natural landscape.

Modification: Human activities may dominate the landscape, but their evidence must blend with the landscape's natural characteristics. Human modifications should appear to be natural occurrences when viewed from a close or moderate distance.

Maximum Modification: Although human activities may dominate the landscape, they must still appear to be natural occurrences when viewed from long distances.

Unacceptable Modification: Occurs when activities do not blend with the landform when seen from any distance. They are visually unrelated to natural occurrences in scale and shape. Because this condition is not an acceptable change, it is not one of the visual-quality objectives.

Existing Situation

In 1973, the visual quality of the Forest was inventoried using the Visual Management System. This inventory was updated in 1983. The following tables show the results of these inventories according to variety, sensitivity level, distance zones, and visual condition.

Table III-50 Variety Class Inventory

Class	Defintion	Acres	Percent
A	Unique or Outstanding	272,500	25
B	Common to the Character Type but not Outstanding	659,900	60
C	Minimal Variety	168,300	15
Totals		1,100,700	100

Table III-51 Sensitivity Levels

Level	Definition	Acres	Percent
1	Highest Sensitivity	533,800	48
2	Average Sensitivity	218,000	20
3	Lowest Sensitivity	348,900	32
Totals		1,100,700	100

The sensitivity levels listed above identify various levels of concern for scenic values. They are used in the visual resource inventories because people's concerns about visual quality vary among different areas of the Forest. Areas seen from well-traveled roads, or places with high public use, have higher sensitivity.

As the observer moves closer, the landscape's characteristics become more critical. The distance zones in the next table are from an observer on a well-traveled route, or at a popular recreation site. Foreground, middleground, and background categories of the inventory include only sensitivity levels 1 and 2.

Table III-52 Visual Distance Zones

Zone	Definition	Acres	Percent
Fore-ground	Within 1/4 to 1/2 Mile of Observer	110,600	10
Middle-ground	From Foreground to 3-5 Miles From Observer	403,400	37
Back-ground	From Middle-ground to Infinity	46,700	4
Totals		560,700	51

The existing visual condition (EVC) of the Forest, as shown in Table III-53, was recorded in 1979. These conditions show the level of human-caused change that was evident at that time. Although expressed in the same terms as the Visual Quality Levels, they are different. EVC measures what is currently on the ground; VQL shows what the future is desired to be.

Table III-53 Existing Visual Condition

Visual Condition	Acres	Percent
Preservation	297,600	27
Retention	556,600	50
Partial Retention	66,100	6
Modification	84,900	8
Maximum Modification	81,800	7
Unacceptable Modification	13,700	2
Totals	1,100,700	100

The amount of human alteration of the landscapes, as presented in Table III-53, was determined from an assumed middleground distance.

Relationship to the Natural Environment

Human beings have altered the landscapes of the Pacific Northwest since prehistoric times. No matter how natural the Forest's environment may seem at this time, it is the result of past natural and human-caused events. Visitors to the Forest have expressed their preference for naturally appearing landscapes. In general, the fewer obvious human alterations, the more pleasing the forest landscape. Exceptions occur. A monotonous landscape, with minimum variety, might be modified to increase the diversity of its vegetation. A landslide, windstorm, or wildfire are forces of nature, but they can also give the landscape an unattractive appearance.

Forest visitors are generally pleased with landscapes that are compatible with wildlife habitats. Stands of old growth, meadows, and riparian areas are usually considered to be attractive. However, habitats based on snags or large downed materials are less appealing. As a general rule, diversity providing the most desirable landscapes also provides the best wildlife habitats.

Natural landscapes featuring bodies of clear, clean water and banks lined with vegetation attract not only human visitors, but also resident and anadromous fish.

Fire is a naturally occurring event in the ecosystem. In the short run, it usually destroys eye pleasing features of the natural environment. In time, fire often enhances the beauty of a landscape by renewing seedlings and increasing plant species diversity.

Timberline Lodge with Mt. Jefferson in distance.

Relationship to the Human Environment

People have expressed considerable concern about the visual quality of the Forest. The sheer beauty of the Forest is clearly a significant part of the region's human environment. The orientation of many people toward a natural appearing environment may cause them to resist change, even when the change is gradual. Others are satisfied with a managed landscape, when it blends into the natural surroundings. Regardless of aesthetic preferences, the Forest's

Map III-23a Visual Management System Inventory

Level 1 and Level 2 Scenic Viewsheds

Level 1

Map Locator	Viewshed Name
1	Columbia Gorge (not mapped)
2	Larch Mountain
4	Lost Lake
5	Bull run Lake (not mapped)
6	Upper Hood River Valley
7	Highway 26 West
8	Lolo Pass
9	Tilly Jane
10A	Highway 35 North of Bennet Pass
10B	Highway 35 South of Bennet Pass
11A	Timberline Road
11B	Timberline Lodge
12	Mt. Hood Meadows
13	Barlow Creek
14	Dufer Mill Road 44
18	Tom, Dick and Harry Mountain
19	Still Creek
20	Trillium Lake
21	Highway 26 East
22	Salmon River Road (not mapped)
24	Upper Salmon (i.e. Timberline Lodge)
26	Parkdale Lava Bed (see Special Interest Area (SIA) Map, Chapter III FEIS)
27	Alder Creek
31	Skyline Road North
32	Highway 216
33	Timothy Lake
34	Rock Creek Reservoir
35	Barlow Road
36	Lower Clackamas River
37A	Upper Clackamas River North
37B	Upper Clackamas River South
38	Hot Springs Fork of the Collawash River
39	Upper Pansey Creek (not mapped)
40	Docleu Creek (not mapped)
41	Elk Lake
42	Rhododendrun Ridge
43	Bull of the Woods
44	Berry Creek
45	Olallie Lake (see SIA map)
46	Olallie Creek
47	South Fork Roaring River (see Eligible Wild, Scenic, and Recreational Rivers (WSR) Map, Chapter III FEIS)
48	Roaring River (see WSR map)
49	Whetstone Creek
50	Rhododendrun Meadow
51	Oak Grove Fork of the Clackamas River
53	Bagby Hot springs (see SIA map)

Level 2

Map Locator	Viewshed Name
AB	Collawash River
AE	Fish Creek
AH	Hideaway Lake
AJ	Shellrock Creek
AL	Boyer Creek
AN	Mud Creek
AP	Road 48 (White River)
AQ	Little Badger Creek
AR	Bonney Crossing
AT	Skyline Road
AU	White River Road
AV	Clear Lake
AW	Linney Creek
AX	Draw Creek/Fryingpan
AY	Wolf Camp Butte
BA	Mill Creek Buttes
BB	Road 27
BD	Gordon Creek
BE	Jordan Creek
BG	Eightmile Point
BI	Diver's Creek
BH	Black Lake
BK	West Fork Hood River-Lolo Pass Road
BL	Indian Creek-Wahtum Lake Road
BN	Badger Lake Road
BO	Laurence Lake Road

Map III-23b Scenic Viewshed Inventory

natural beauty will continue to be a high priority, as the surrounding populations and use levels increase.

Management Concerns

During the 20 years following World War II, few people paid particular attention to the effects of Forest management on scenic quality. More recently, attempts have been made to retain the integrity of the landscape while managing for timber production and other resources. Since 1974, the future visual character of the Forest has been expressed in the form of recommended visual quality levels. Prior to the LRMP, the visual quality levels, as displayed in the table below, were the visual guidelines for management activities. They are based on the updated 1983 visual resource inventory.

Table III-54 Recommended Visual-Quality Levels

Visual Quality Levels	Acres	Percent of Forest's Gross Acres
Preservation (mostly wilderness)	191,000	17
Retention	118,000	11
Partial Retention	273,900	25
Modification	418,900	38
Maximum Modification	99,000	9
Totals	1,100,700	100

The Forest has been divided into viewsheds based on the sensitivity levels, the existing visual conditions, and the recommended visual quality levels discussed in this section (Map III-23b). These viewsheds can be managed under different management schemes to achieve different Visual Quality Objectives. The management of different combinations of viewsheds for given Visual Quality Objectives can provide Forest visitors with various scenery patterns along sensitive travel routes and from sensitive viewpoints.

The analysis of effects on visual quality, related to these viewsheds is presented in Chapter IV. The map accompanying this discussion depicts the boundaries of the viewsheds on the Forest. The sensitivity level of the viewshed is based primarily on the volume and type of traffic on a roadway, trail, or recreation area. Level I (Primary) viewsheds are considered to be the most important.

Forest managers, as well as other State and Federal agencies, recognize the role of landscape scenery in attracting tourism to Oregon. There is an ongoing attempt to balance resource outputs with the needs of our society. Management of scenery as a resource is an established policy in the Forest Service. There are costs and other trade-offs associated with this program. Visual resource management normally reduces the amount of timber which can be removed from an area over a given time period. The size and shape of created openings may have to be specially designed to achieve the objectives for visual quality. Costs increase for logging operators, as well as Forest management, in scenic viewsheds. Roads and power lines may be redesigned or relocated to avoid detractions from the natural landscape. In some situations, road building may create excessive impacts. New or expanded recreational sites must be designed with visual impact in mind. Ski runs and lifts may create unnatural lines on a hillside. Aesthetic design and location criteria for buildings and altered vegetation can allow for the addition of these features to the natural landscape.

Cultural Resource Management

Background

Cultural resources are buildings, artifacts, or archeological sites that remain from human activity that occurred in past eras. They are the physical remnants of over 10,000 years of human activity in the area now known as the Mount Hood National Forest. The sites could include Indian village sites, logging towns with the remains of dwellings, stores, a mill and railroad, mines, a 19th century trading post, tools, cooking utensils, or caves or other types of dwellings. They may be very prominent and visible, or they may be invisible and buried under the present land surface. Cultural resources may have archeological, historical, or architectural values, and each is unique because it is irreplaceable When any elements of our national heritage are destroyed, they are gone forever. Faced with the increasing loss of these treasures, Congress acted to protect them by passing the following laws: the Antiquities Act of 1906, the Historic Sites Act of 1935, the National Historic Preservation Act in 1966, (amended in 1980), Executive Order 11593, and the Historical and Archaeological Data Preservation Act of 1974. In addition, two very important laws are the American Indian Religious Freedom Act of 1978, and the Archeological Resources Protection Act of 1979.

Existing Situation

We presently know of about 1,000 cultural resources located on the Forest. They include Native American and Euro-American resources which range in age from 8,000-year old archeological sites, to structures, roads and trails built in this century. Native American groups that use areas on the Forest include the Clackamas, Cascades, Hood River Wasco, Tenino, and Molalla, as well as the Paiutes affiliated with the Northwest Coast, Columbia Plateau, and Great Basin Culture Areas. Euro-American use began in the 19th century, which altered the landscape forever.

Available evidence indicates that early Native American use of the Forest was, for the most part, transitory. They moved through the forest in response to the seasons and to their needs for particular resources. Various sites contain evidence of their activities, An example is an assemblage of stone tools and waste found in an area that may have been used by a family as a seasonal campsite. Materials of this type, called lithic scatters, are usually small and located at higher elevations. Several large sites of more than 20 acres have been discovered along major water courses. Scattered tools or abandoned campsites may indicate the route of an old Indian trail, or a small village. Stands of cedar trees stripped of bark suggest these peoples made bark baskets and clothing. Warm Springs Indians have told us that clusters of rock cairns could be the remains of a visions quest site, or the result of a celebration or commemoration ceremony. Many of the roads and trails on the forest today are on routes used by the Indians before Euro-American settlement.

Immigration of Euro-Americans from the East drastically changed Native American lifestyles in the last century. In 1855, representatives of the Warm Springs tribes signed a treaty which relinquished approximately 10 million acres of land to the U.S. Government. This treaty reserved the present-day Warm Springs Reservation for them. Several Paiute bands moved to the Reservation after 1879 to become part of the Warm Springs Confederation. Native Americans continue to use the Forest today. Present day uses include berry and native plant gathering, hunting, and religious ceremonies.

When Euro-Americans first came to the Oregon Territory they viewed the Forest as an obstacle, and not as an area with productive resources. The Barlow Road is an example. It was opened in 1846 as an overland route for settlers who were on their way to the Willamette Valley. The Road was an alternative to rafting their belongings down the Columbia River. This road was finally replaced by the Mt. Hood Loop Highway in 1925.

By the late 1800's, Euro-Americans began to find value in the Forest's timber and recreation amenities. The first developed recreational site was on the northeast flank of Mt. Hood; Cloud Cap Inn was built there in 1889. During the 1920's, recreation activities shifted to the south side of Mt. Hood near Government Camp, This focus culminated in the completion of Timberline Lodge in 1938. Additional recreation sites with a history of long, continuous use are Bagby Hot Springs (1881), Eagle Creek Campground (1916), and Multnomah Falls Lodge (1925).

Logging began on the edges of the Forest in the 1880's. Logged areas included the eastern creek drainages, the Larch Mountain area, the LaDee Flat area, and the West Fork of the Hood River. Large scale timber harvest did not move to the rest of the Forest until after World War II. Major cultural resources that represent other uses were also established. They include the Mill Creek Community (mid-1800's) the Bull Run Waterworks,(1893) and the Three Lynx-Oak Grove Hydroelectric Project (1924).

Early mill crew, circa 1920s.

The U.S. Government has administered the area now known as Mt. Hood National Forest since 1893. In 1907, the Department of Agriculture began managing the Cascade Forest Reserve. In 1908, boundaries close to the Forest's present boundaries were established for the Oregon National Forest. It was renamed the Mt. Hood National Forest in 1924. Through the years, the Forest Service has built ranger stations, guard stations, lookouts, and a system of trails to help manage the 1.1 million acres within the Forest. During the great depression of the 1930's, the Civilian Conservation Corps built or expanded the Zigzag, Parkdale, Columbia Gorge, Oak Grove, and Clackamas Lake Ranger Stations These sites represent the last major expansion of administrative facilities on the forest. Additional details about the Forest's cultural resources may be found in the Cultural Resources Overview of the Mt. Hood National Forest (Bryant, Conton, Hurlbett, and Nelson, 1978), and the Cultural Resources Overview: Clackamas and Badger Jordan Planning Units (Ellis, 1979).

By January 1990, 350,000 acres had been inventoried for cultural resources. This represents about 30% of the total Forest area. If an average of 45,000 acres are inventoried each year, approximately 80% of the Forest will be inventoried by the year 2000. If the current rate of discovery continues, it is estimated that more than 2,000 cultural resources will be inventoried by that time.

The National Register of Historic Places lists sites and structures which have local, state, or national historical value. Places with national historical significance are identified as National Historic Landmarks. At the present time, thirteen properties on the Forest are listed on the National Register of Historic Places:

- Timberline Lodge
- Zigzag Ranger Station
- Cloud Cap Inn
- Parkdale Ranger Station
- Clackamas Lake Ranger Station, Cascade Work Center
- Cloud Cap-Tilly Jane Recreation Area
- Columbia River Scenic Highway
- Multnomah Falls Lodge
- Eagle Creek Campground, overlook and picnic area
- Silcox Hut
- Bagby Hot Springs

Timberline Lodge is also a National Historic Landmark and is representative of "depression era" work done by artists under a government program. Two more properties were nominated for listing in 1986: The Oak Grove Work Center and the Olallie Lake Guard Station. Barlow Road, and its associated sites, has been designated as a segment of the Oregon National Historic Trail. A National Register Nomination is currently being prepared for the Barlow Road Historic District. All standing structures listed on the National Register, or those determined eligible for listing, are actively maintained. Historic structures are maintained by permittees under the Special Use Permit Program in compliance with the Secretary of Interior's Standards for Historic Preservation Projects.

Relationship to the Natural Environment

The protection of a cultural site can often protect other environmental values. Similarly, the protection of environmental values often has a positive effect on preservation of cultural resources. As an example, cultural resources associated with riparian areas may be protected by preserving the riparian area. The protection of animal species that are dependant on old growth can contribute to the protection of cultural resources in old-growth areas. Forest resources managed to minimize the risks of natural disasters, such as earth slides and fires, can reduce the risk of destroying cultural resources.

Relationship to the Human Environment

The benefits of cultural resources to the American public are both tangible and intangible. Tangible benefits include the attraction of cultural resources findings for visitors. These findings are particularly beneficial when a good interpretive program has been developed. Intangibly, cultural resources can help communities to feel increased respect for their heritage, and to feel the continuity that exists between past the and the present. Cultural resources may help to increase self-esteem within communities. These kinds of values are priceless.

Management Concerns

The recreational use of the Forest increases the need to protect its cultural resources, which people can damage through ignorance or malice. The potential for damage increases in proportion to the amount of public use. Another potential for damage is the construction of small scale recreation projects in areas which could contain cultural resources. The amount of damage that has been done to cultural resources is not known, but the cumulative effect could be great. However, cultural resources, particularly those supported by interpretive programs, have high potential for enhancing recreational experiences. Historic roads and trails, such as the Barlow Road, illustrate how these resources could be used to develop new facilities for recreation, while helping to disperse hikers.

Timber harvesting can be a threat to cultural resources. The current policy is to avoid disturbing them, when practicable. Thick vegetation can hide sites, which can lead to their destruction before anyone has seen them. By increasing site visibility that is caused by timber harvesting, these areas can be identified more easily. This can lead to vandalism and illegal collecting. The road construction associated with timber harvesting adds to this threat by increasing the accessibility of backcountry areas. The flat ground favored by road builders has a high probability of containing cultural resources, with the resulting risk of their destruction. The risks of destruction are particularly high during bridge building or reconstruction.

In some areas, culturally significant resources may be addressed by the management objective of "preservation in place", and may prohibit most methods of timber harvest. This leaves full-suspension and helicopter yarding as the only acceptable procedures. The potential benefits of timber harvest and road construction are the removal of obscuring vegetation, increased ground visibility, and quicker access to remote areas for surveyors. This increases opportunities for the discovery of sites, and reduces the costs of conducting surveys.

Geothermal exploration and construction of small hydroelectrical sites are also threats to cultural resources. Streamside areas are prime locations for cultural resource sites; their presence in those areas could delay the project, or could increase project costs due to site mitigation.

Range use also requires steps to assure cultural resource protection. Animal trampling in ranges can break fragile cultural remains. The uncontrolled burning of range to renew grasses and forbes can destroy historic structures and damage prehistoric stone tools.

A side benefit of erosion control is that it generally will protect prehistoric sites hidden in the soil mantle. Activities that lessen the impact to soil usually result in less impact to cultural sites. Ground-disturbing activities would not take place in sites managed for in-place preservation.

The major goal of the cultural resource program is to preserve significant sites and materials for scientific study and public use and enjoyment. The location and protection of significant cultural resources will help to achieve this goal. The need for a long-term strategy to discover and protect cultural resources is a special management concern. No strategy exists at this time. Timberline Lodge, and the Clackamas Lake Ranger Station operate under the required management plans. Plans are currently being prepared for Barlow Road and Tilly Jane District. Building maintenance in the past has preserved the cultural qualities of the structures, and maintenance today remains sensitive to their historic values. However, preservation treatment, maintenance, rehabilitation, and priorities for the long term have yet to be identified.

Another management concern is the lack of programs for managing resources that were traditionally used by Native Americans under the terms of the American Indian Religious Freedom Act. In compliance with the Act, the Forest provides access to sites, use and possession of sacred objects, and freedom of worship through ceremonial and traditional rites. Native Americans are free to gather huckleberries and other plants on the Forest as they desire.

The cultural resource management requirements of the Forest can seriously impact fire management activities. Fires remove obscuring vegetation, and make surveys for cultural resources easier. However, cultural resource preservation may require low intensity fires, hand-piled slash, relocation of fire lines, or the complete elimination of a prescribed burn.

A final management concern is the lack of interpretive programs to increase public awareness and enjoyment of cultural resources. Some well-known resources have enhancement programs. Visitors can see a slide-tape program on the prehistory and history of the Clackamas River area at the Estacada Ranger District. A slide-tape program about the Barlow Road is available at the Zigzag Ranger District. Timberline Lodge has a number of interpretive programs, which includes movies and guided tours. Abbot Road, Cloud Cap Inn, and sites along the Barlow Road have interpretive signs. Tollgate Campground has a reconstructed tollgate of the Barlow Road. On-site enhancement is lacking at more than 60 sites where themes could be developed. Potential themes include transportation, recreation, lumbering, the Depression Era, energy, fisheries and the Forest Service. Archeological sites which do not lend themselves to on-site enhancement could be interpreted through slide-tape programs, brochures, and scientific publications.

Indian Interests

Background

Native Americans inhabited the Pacific Northwest long before Europeans explored it. They hunted, fished, gathered plant foods, and held religious ceremonies on the lands that are now the Forest. In the 1800's, settlers emigrating from the East severely disrupted their way of life. In 1855, tribal representatives hoped to resolve their problems by signing a treaty relinquishing approximately ten million acres of land to the U.S. government. Today's Warm Springs Reservation was set aside for the Wasco and Walla Walla (Warm Springs) tribes, which were joined on the reservation by several Paiute bands after 1879. This took place after the Malheur Reservation for the Paiutes reverted to public domain when the Paiutes left the reservation to fight the U.S. Army.

In 1937, the three tribes adopted a constitution and by-laws for tribal government and became organized as the Confederated Tribes of the Warm Springs Reservation. The tribal government now manages timber, water, salmon, and other reservation resources for the benefit of its members. The Tribes own and operate the Kah-Nee-Ta resort.

Beginning in 1877, a strip of land known as the McQuinn strip became the source of litigation between the Tribes and the Federal government. A 1972 court case settled the dispute by transferring 61,000 acres of Forest land to the Confederated Tribes. The area in dispute was jointly managed from 1948 until the final settlement. After the settlement, the Forest Service continued to administer the two campgrounds and the Pacific Crest National Scenic Trail under the McQuinn Act. This agreement is subject to joint approval of management plans by the Tribes and the Forest Service. The Bureau of Indian Affairs provides funds for maintenance and operation.

The location of the Warm Springs Indian Reservation, which is adjacent to the southeastern boundary of the Forest creates mutual concerns. The Native Americans have vital interests in the management of the Forest. The Forest has comparable interests in the land uses of the reservation. Native Americans who are not members of the Confederated Tribes also take special interest in the Forest's resources. Members of tribes with treaty rights to fish for salmon in the Columbia River are understandably concerned with activities which may affect supplies of anadromous fish.

Existing Situation

Leaders of the Confederated Tribes cooperated with Forest management on the development of the Warm Springs Comprehensive Land Use Plan that was adopted in 1983. Under this plan, most reservation lands adjacent to the Forest were designated to remain forested. Roads, transmission lines, old mill sites, ranger stations, lookouts, and recreation sites are the only developments permitted to remain. Timber management and harvest is the primary use on the Warm Springs Reservation. Compatible secondary uses include the maintenance of fish and wildlife habitats, traditional food gathering, and livestock grazing. Any uses that would reduce the land base for timber production are considered to be incompatible. Housing on these lands does not exist, with the exception of the Bear Springs Compound.

Tribal members are presumed to be the main users of recreation lands on the Forest adjacent to the Olallie Lakes area. Recreational pursuits which preserve the natural and scenic characteristics are the primary uses of the area. Compatible secondary uses are fish and wildlife habitat maintenance, and traditional food gathering. Most types of development and intensive resource uses are excluded, and are considered to be incompatible.

A designated wilderness area, Mt. Jefferson, is located south of the Olallie Lakes area. Wilderness is very important to many tribal members. To the east of this area are lands used as range for grazing livestock, roads, powerlines, fences, and scattered rural housing.

Traditional Foods. Native Americans rely on the Forest for traditional food and craft products needed for their cultural practices. Huckleberries gathered and eaten during ceremonies, feasting, and celebrations are one of the most important uses of these foods. Some traditional huckleberry gathering areas have been identified on the Forest. In recent years huckleberries have become more scarce as trees have replaced these areas.

Relationship to the Natural Environment

Traditional foods eaten by Native Americans come from plants that grow wild on the Forest. The table below shows native plants that are used for food and crafts. These plants utilize all Forest habitats, including marshes, dry areas and rocky sites.

Table III-55 Habitats of Plants Commonly Gathered by Native Americans

Riparian Areas	West Side Forested	East Side Forested	Dry Sites	Rocky Sites
Willow	Huckleberry	Choke cherry	Biscuit root	Bitter root
Tulle	Blackberry	Black moss	Balsam root	Wild onion
Cattail	Strawberry	Bear grass	Wild carrot	Strawberry
Wild celery	Bear grass	Camas		
	Redcedar	Strawberry		
		Onion		
		Huckleberry		

Wild-growing huckleberries, which are a high priority resource to Native Americans, must have direct sunlight to grow. In the natural environment, fire or other natural disasters would create sunny clearings where the berries could thrive. In past years, Native Americans often deliberately created such openings to promote huckleberry growth. The recent Forest Service management of lands for timber has encouraged the growth of trees, and has resulted in a diminishing number of huckleberry plants. The best time for huckleberry growth is the period following a fire or logging operations, and after the first growth of grasses and herbs. Huckleberry plants lose vigor and die as soon as trees grow large enough to shade the area.

Native Americans hunt deer and elk. These animals thrive where there is a combination of forest cover and open areas for grasses and herbs. Salmon is the most important fish to Native Americans. Salmon must have cool, clean water for reproduction and early growth. Riparian areas must be protected for salmon to remain available.

Relationship to the Human Environment

For many Native Americans, the practice of their traditional customs may be among the most important activities in their lives. Their traditions are mostly maintained by older members of the tribes, but the younger generations are beginning to exhibit renewed interest in their cultural inheritance. The Forest will continue to cooperate with the Tribes to enable them to continue their traditions.

The needs for abundant huckleberries and timber production can conflict with each other. Intensive silvicultural methods, such as tree planting, brush removal, and timber stand improvement discourage the growth of huckleberry bushes. Timber harvesting encourages the growth of the bushes, and natural succession would allow huckleberries to grow on logged areas. If the Forest were to arrange the planting of huckleberry seedlings after timber harvests, the plants could assure a supply of berries for up to ten years. At the ten year point, the seedlings would be large enough to shade out the bushes.

Roads built in association with logging could provide easier access to high elevations where huckleberries are most abundant. Roaded access to such areas would be very helpful to older Native Americans. The past fire suppression practices have reduced the acreage containing abundant supplies of huckleberries. Controlled burns could help to increase the supplies by keeping openings clear of trees, which prolongs berry production.

Management Opportunities

Cooperative land use between the Tribes and the Forest is a major concern. The need to continue the Land Use designations in the Comprehensive Land Use Plan of the Warm

Springs Reservation is important, and the compatibility of forest management adjacent to the Reservation is also critical. The present designation of Forest and Reservation lands will assure future compatibility Lands designated for similar activities, such as timber products, recreation, and wilderness, share adjacent boundaries on the Forest and the Reservation.

The question of designated huckleberry management areas could become a subject of concern. No lands currently hold this designation. The quality of huckleberry gathering sites can change annually.

The assurance of continued cooperation between the Confederated Tribes and the Forest is another area of major concern. Both parties work closely to manage fisheries habitats on streams which originate on the Forest, and flow into the Warms Springs Reservation. The Warms Springs tribes are a part the Columbia River Inter-Tribal Fish Commission (CRITFIC). CRITFIC is the coordinating agency and technical resource regarding fisheries issues for the four tribes that reserved fishing rights in the 1855 treaties. The Confederated Tribes coordinate land use management and the gathering of traditional plant foods.

Land Ownership

Existing Situation

The Mount Hood National Forest encompasses over 1,100,000 acres in Clackamas, Hood River, Jefferson, Marion, Multnomah and Wasco Counties, Oregon. Within the boundary, about 50,000 acres are in non-Forest Service ownership. These lands include ownership by other federal agencies, private lands surrounding townsites, timber company lands, state, county, and city owned lands.

Over 186,000 acres are included in the National Forest System land have been legislatively designated as Wilderness Areas. In addition, several thousand acres are included in Natural Research Areas and special interest areas. The Columbia Gorge National Scenic Area encompasses approximately 33,875 acres.

The area of Forest Service land within the Columbia River Gorge National Scenic area is managed under the terms of Public Land 99-663, which was enacted Nov 17, 1986. P.L. 99-663 established the Columbia River Gorge Commission, and designated the responsibilities of the Commission. The Act authorizes the acquisition of lands and interest, as needed to satisfy the purposes of the Act. Land acquired in the State of Oregon becomes part of the Mount Hood N.F. The purposes of the Act are:

- To establish a national scenic area to protect and provide for the enhancement of the scenic, cultural, recreational, and natural resources of the Columbia River Gorge; and
- To protect and support the economy of the Columbia River Gorge area by encouraging growth to occur in existing urban areas and by allowing future economic development in a manner that is consistent with the above paragraph.

Relationship to the Natural Environment

An ongoing land adjustment program includes the following components: Acquisition of tracts that are identified as important to conserve fish and wildlife habitat, protection of environmentally and historically sensitive areas, consolidation of ownership to increase management efficiency, protection of exceptional scenic qualities and provision of recreation opportunities for the public.

All land adjustment actions, including purchase, exchange and donation, are subject to analysis and public involvement under the National Environmental Policy Act.

Relationship to the Human Environment

Land, and land ownership are critical elements of the Forest's human environment. Land ownership adjustments are usually conducted in the form of Land exchanges. Land exchanges between the Forest and private land owners can improve timber-management programs. These can consolidate ownership, and eliminate the costs of surveying boundaries and rights-of-way negotiation prior to a timber sale. Forested land exchanged for land that is planned for recreation or wildlife management may lead to reduced timber production. People who enjoy recreation and scenic views benefit from exchanges which improve visual quality. Special interest areas may be created through exchanges made with Land and Water Conservation Fund appropriations. As a result, environmentally sensitive areas, unique geological formations, wildlife habitat, and historically significant sites can be protected.

Management Concerns

The impact of private land ownership on and near the Forest is a source of concern. Land adjacent to densely populated areas may be considered for exchange, as the need for community services increases. County planners and Forest Service work together to coordinate plans for community development.

Table III-56 Land Acquired Under the Plan

Group	Location	Acres Acquired	Acres to Acquire
Group II	Columbia Gorge	982	663
Group II	Hood River Valley	1,037	8,176

Table III-57 Land Ownership Groups

Group	Definition and Direction
Group I	These lands are those to be used for a specific Congressionally designated purpose. The designation from Congress may be direct or indirect. Examples of these lands are Wilderness Areas or National Recreation Areas.
Group II	These are lands which are critical for managing the resources of the forest. Examples are fish and wildlife habitat or critical areas subject to soil damage. Lands in the Columbia Gorge fall into this group.
Group III	These are lands to be acquired or exchanged in order to consolidate the forest. If intermingled lands are exchanged, administration by both the Forest and the other landowner becomes easier.
Group IV	These are isolated parcels of forest lands located outside the Forest boundary to be used as trading stock for land acquisition elsewhere.
Group V	These are lands in areas which require more study. On this Forest these areas are the Government Camp area, the ZigZag-Rhododendron area and the vicinity of the Bull Run Reserve.

Table III-58 Land Ownership Planning

Group	Total Acres	Acres to Acquire	Acres to Dispose
Group I	50,738	640	N/A
Group II	153,135[1]	1,645	N/A
Group III	855,465[2]	9,212.57	0
Group IV	39,098	N/A	7,706
Group V	13,045	N/A	N/A
Total Acres	1,108,481	11,497	7,710

[1] *Includes 38,500 acres in the Columbia Gorge Composite Area.*

[2] *Includes 220 acres outside the National Forest boundary.*

Special Use Permits

Background

For many years, residents of the Portland-Vancouver metropolitan area have looked upon the Forest for leisure activities. Many people also use the Forest for a number of special purposes. When someone applies for a permit to use National Forest land, the application may be approved if the proposed activity is compatible with other uses, and conforms with the Forest Plan.

Existing Situation

The major types of special use authorizations currently in effect on the Mt. Hood National Forest are shown in the following table.

Table III -59 Special Use Authorizations

Types of Special Use	No. of Permits
Recreation Residences	559
Miscellaneous	72
Water Related Uses	70
Access Roads	28
Electronic Communication	19
Telephone ROW	18
Power Related	12
Outfitter-Guide	11
Organizations	8
Resorts	3
Total Special Use Permits Issued	800

A total of 16,980 acres are authorized for use by special permit. The Bonneville Power Administration rights-of-way account for over 3600 additional acres used for power-line related facilities.

The demands for special uses on the Forest will continue. The Forest's proximity to a large, growing metropolitan area, as well as to many small communities, assures that demand will be high. Special use permit applications for projects which benefit the public will receive a higher priority than those which limit public use.

Relationship to the Natural Environment

The impact of special uses of Forest resources on the natural environment varies with the type of activities involved. For example, a one day ski race has far less impact than the development of a downhill ski facility. All applications for special use permits are subject to an environmental assessment. Mitigation measures may be required to address short term impacts.

Certain types of new special use permits could have significant impact upon natural systems. Requests to construct small hydroelectric plants, or to start geothermal and gas operations could cause immediate concern about their effects upon the Forest environment. Utility and transportation corridors have significant impacts on natural systems and on other uses of the Forest. Further discussion of these uses is included in the Management Concerns section below.

Relationship to the Human Environment

By issuing a special use permit, the immediate need of an individual or group is accommodated. However, the land required to satisfy the permittee may become unusable for the public. The use of land for private operations may preclude public benefit programs like timber production, recreation, or wildlife.

Urban Support Services. The increased urbanization of areas near the Forest may lead to requests for the construction of urban service facilities, such as sewage treatment plants and solid waste disposal sites. Forest Service representatives would work with State and local government officials to locate solid waste disposal facilities on non-federal land. Liquid waste disposal is rarely compatible with National Forest purposes, and hazardous waste disposal is not an appropriate use of National Forest land. Land adjustment actions such as exchanges and sale for community purposes, may be considered.

Summer Residence Permits. Within the last 10 years, the policy on summer home permits has changed from annual issuance to term issuance. Under the present policy, permits last from five to twenty years and can be renewed by the permittee at the end of the term. If the Forest does not intend to renew the permit, notice is issued to the permittee ten years prior to the expiration date. The policy also limits the number of summer homes to those currently available. No new summer home lots are available.

Major Winter Recreation Resorts. Historically, ski areas on National Forest lands have operated under two types of special use permits. Buildings and parking lots are covered by a term special use permit, which is usually issued for a period of 30 years. The remaining acreage necessary for ski lifts and ski runs/trails, is covered by annual special use permits. In 1986, Congress enacted the National Forest Ski Areas Permit Act, which authorizes the consolidation of annual and term permits into one term permit for the entire ski area. These permits are effective for up to 40 years. Four of the ski areas on Mt. Hood will have the option to switch to the new permit in the near future. Timberline ski area, however, does not have the option of switching because of the inclusion of Government owned facilities (i.e. Timberline Lodge, Wyeast Day Lodge, Mile Chair lift) as part of the operation. Timberline will continue to operate under special use permits that are unique to the Timberline situation.

Downhill racer.

Ski area permits are issued for the purpose of constructing, operating and maintaining a public service area. Winter sports are emphasized, but summer recreation is also included. Ski area permits only authorize use for the area occupied by facilities (such as buildings). Additional public uses, such as hunting, hiking and fishing are generally allowed. An exception would occur when these uses are determined to materially interfere with the operation of the ski area.

The issuance of recreation special use permits is based on two criteria:

- The requested use applies to a significant number of the recreating public.
- There is a genuine public need for the services. Both public benefits and public costs are considered in issuance of these permits.

Management Concerns

Although presently issued special use permits seem to have had little or no unfavorable impact upon the Forest's resources, a matter of concern previously stated is the potential impact of certain types of special uses. These specifically include hydroelectric, geothermal, and oil and gas developments.

Special concerns have been expressed about the possible impact on the Forest's environment resulting from transmission lines and other utility corridors. At present, the Forest has more than 3,000 acres of powerline rights-of-way, three major highway systems (Highways 26, 34, and I-84), plus a number of smaller transmission and utility corridors.

Since other sources of energy and electricity could be developed on the Forest, the impacts of utilities and transportation systems on other resources need to be minimized. Over the near term, no new major powerline corridors on the Forest appear to be necessary. Therefore there is no need to identify potential utility and transportation corridors. However, the demand on existing corridors could increase. Proponents of small hydroelectric projects have tried to locate their developments close to major powerlines to reduce their transmission costs. Such demands could require the construction of short connector systems and the need to widen existing powerlines. Under present and future management policies, the Forest plans to continue looking for opportunities to encourage the use of existing utility corridors.

Economics

The United States Treasury receives more than $350,000 in annual use fees from Mt. Hood National Forest Special Use permits. Of this total, over $340,000 is a direct result of the uses in the "recreation" category. This includes the summer home rental fees and the fees from the major winter resorts on National Forest land. A portion of these collections are distributed to counties, along with other Forest receipts.

Law Enforcement Program

Background

Crime has become an increasingly serious problem on the Forest. The minimum requirements of Forest law enforcement activities are to ensure the voluntary compliance with the nearly 200 federal laws and regulations written to protect the Forest's visitors and resources, and to make sure that the government's interests are protected in the event of a claim for damage.

Existing Situation

The Forest lies within a two hour drive of the metropolitan Portland. This urban population, as with most comparable areas of the far West, has grown significantly. Urban problems, including unlawful activities, have grown along with the population. As the number of Forest visitors from the metropolitan area increased, they brought an increasing amount of law violations. Criminal acts such as marijuana cultivation, drug dealing, narcotics manufacture, kidnap, rape, and even murder are among the most serious problems. The illegal cutting of merchantable logs, green trees, wildlife snags, and timber theft are the major property crimes. Thieves also steal Forest and logging company property, and frequently break into parked vehicles. Vehicles parked at trailheads are the most common targets. Some crimes are less serious but are very aggravating. These include disturbances at campgrounds, violations of road closures, dumping garbage, and vandalism.

Vandalism is a law enforcement problem.

In 1989, the Law Enforcement Management Reporting System (LEMARS) statistics was used to pin-point forest-wide problems. A trend was seen in the increase in timber and recreation-related crimes. Theft of merchantable logs, firewood and other forest products are on the increase. In addition, crimes against the public have become a major area of concern. The Forest Service has no jurisdiction over crimes against the public, and must depend on the cooperative law enforcement agreement that exist with the County Sheriffs. Also in 1989, the Forest noted an increase in the manufacture of illegal methamphetamine and other narcotics on the Forest.

In addition to coping with increased crime, Forest personnel assist county officials with search and rescue operations.

Relationship to the Natural Environment

Criminal behavior is destructive and harmful to both the biological and physical environments of the Forest. Standing green trees have been girdled, that were intended to be cut for firewood. RV waste and grey water tanks have been dumped into streams. In addition, a large number of toxic waste dump sites have resulted from the discharge by methamphetamine labroratoratories on the Forest. These can be hazardous to the visitor, as well as to the environment. Carelessly used ORV's can cause localized soil erosion, damage to snow parks, and destruction to dispersed camping sites.

Relationship to the Human Environment

Law enforcement on the Forest is a problem for people and property. The theft of Forest and private property adds to management costs. Thefts and acts of violence, whether against employees or visitors, add fear to the environment. When people must worry about becoming a victim of criminals, pleasure begins to disappear, and the quality of employees' work begins to suffer. Overnight campers can be terrorized by disturbances such as unacceptable noise, drunkenness, and fights.

The impact of unlawful activity on the human environment can be expected to increase in severity and frequency as the use of the Forest increases along with increases in the nearby population. Possible future problems include anti-social people hiding out on the Forest in violation of Federal laws, and a drastic increase in the theft of natural resources, if economic trends should bring on hardship to families and individuals.

Management Concerns

The very nature of the Forest, with its huge expanses of remote, forested lands, compounds a law enforcement problem that is already difficult. A Forest officer, for example, may encounter criminals in the act of committing a crime. If the officer is alone, without immediate backup, it may be difficult to apprehend the suspects.

At the present time the Forest has set up a Zone Law Enforcement organization. The District Zones are: Estacada/Clackamas, Columbia Gorge/Zig Zag/ Hood River, and Barlow/ Bear Springs. Each has Zone Law Enforcement Officers,and have the potential for additional law enforcement help if needed. In addition, the Supervisor's Office has added a second Criminal Investigator to handle the increased investigative workload. A new Forest Law Enforcement Plan has helped to clarify roles, increase awareness, identify funding levels, set priorities, and encourage each zone to set up aggressive follow-up on all reported incidents. It also requires each forest employee to take responsibility by reporting and acting on all violations.

A major management concern in law enforcement is the increased vandalism and theft of logging equipment. Insurance has become more difficult and expensive for logging operators to obtain. This affects their ability to bid for Forest timber. Due to these added expenses, operators offer lower prices than they normally would.

Another increasing problem is illegal firewood cutting. Snags intended for wildlife use are commonly felled in violation of Forest regulations. Commercial firewood cutters violate their personal use permits. Trespassers are usually hunters, fishermen, or others who are aware of the laws. They misuse the watersheds of the Bull Run and The Dalles, which are closed to public use.

A special management concern is the need to maintain cooperative arrangements between county law enforcement officials and Forest personnel. Forest personnel involved with law enforcement include criminal investigators and "Level IV trained" Law Enforcement Officers with authority to make arrests. The Forest supplements these officers with other Forest officials, as needed. However, local enforcement officers remain responsible for crimes against private property. Sheriffs of the four counties that are within an bordering the Forest are responsible for the protection of visitors through cooperative agreements with the Forest. Another cooperative agreement between the Forest and Oregon provides for drug enforcement overflights. The need for coordination of the Forest's internal law enforcement procedures with the law enforcement policies and practices of four different jurisdictions is both urgent and necessary.

Map III-10 Potential Spotted Owl and Bald Eagle Habitat Areas

Chapter IV

Environmental Consequences

CHANGES BETWEEN DRAFT AND FINAL

- The 1972 Timber Inventory was completely replaced with new data collected in the 1986 Vegetation Inventory. The entire Forest was mapped by vegetation type. Land with less than 10% tree cover was classified non-forest.
- Land suitability for timber management was completely reevaluated in 1988.
- Empirical Yield Tables were replaced with new tables based on the 1986 Vegetation Inventory.
- Strata used in the Vegetation Inventory were regrouped according to similarity of site index. These site index groups were used as the basis for Managed Yield calculations.
- Managed Yield Tables were completely replaced.
- Uneven-aged management was added to the list of options.
- PROGNOSIS was used to model East-side and Uneven-aged Managed Yield Tables. DP-DFSIM and DFSIM were used to model west-side tables (same as draft).
- DP-DFSIM was provided a noble fir growth curve in one component where this species is the principal management species.
- Fertilization was permitted on all components of the western hemlock and Pacific silver fir zones where Douglas-fir is a principal management species.
- Managed Yield Tables with natural regeneration and Managed Yield Tables based on low stocking levels were provided but later removed from FORPLAN because FORPLAN did not make significant use of them, their effect on ASQ was very small, and there was a critical need to reduce the model size.
- Board Foot/Cubic Foot ratios were replaced by new factors based on the 1986 Vegetation Inventory.
- The Regional "Managing Competing and Unwanted Vegetation" FEIS, Record of Decision (1988), and Mediated Agreement (1989) has been incorporated into the analysis of effects, including reduced emphasis on burning and herbicides.

Table of Contents

Chapter IV - Environmental Consequences

Introduction

The purpose of this chapter is to disclose the environmental consequences of implementing the alternatives described in Chapter II. Relative to the existing conditions and affected environment described in Chapter III, each alternative potentially impacts various components of the environment. Those effects are presented in this chapter, and form the scientific and analytic basis for the environmental comparison of alternatives summarized in Chapter II. The focus of Chapter II is primarily on outputs, activities and economics of the array of alternatives.

Within each environmental component, a list of related Issues, Concerns, and Opportunities (ICOs) is provided. This list should provide the reader with information about other areas in the Chapter that also may be of interest.

Impacts on components of the environment are discussed in terms of their significant direct, indirect, and cumulative effect(s). Direct Effects are generally the result of land allocations to Management Areas that prescribe permissible activities on lands within the area's perimeter. Agency activities and the inherent capability of the land provide goods and services that may be consumed by the public. Government expenditures that finance agency activities are treated as a direct effect in the economics section of this chapter.

Indirect Effects generally occur when the public takes advantage of the opportunities provided in each alternative. Public use of the Forest for recreation (including hunting and fishing), timber harvest, and mineral withdrawal, for example, can have adverse effects on the other components of the environment. The value to society (benefits) of goods and services are treated as indirect effects in the economics section of this chapter, as are the impacts on revenues, jobs, and income.

Cumulative Effects deal with both the synergistic effects over time and the incremental change from existing conditions given the combined actions of the agency and other ownerships. They are the result of past, present, and future actions that are primarily of a biological and physical nature. The net effect on individual program efficiencies, jobs, income, and social parameters (such as community stability), are treated as cumulative effects in the economics section of this chapter. Some of the effects are described in qualitative terms, while others are described in quantitative terms.

All effects disclosed in this chapter assume complete compliance with the Standards and Guidelines summarized in the FEIS, Appendix D, and the Forest Plan, Chapter IV. Environmental consequences would be far more severe, or unacceptable, in the absence of Standards and Guidelines and accompanying Best Management Practices (BMP's). These Standards and Guidelines contain many of the mitigation measures that avoid, minimize, restore, replace, reduce, or eliminate probable or potential environmental impacts. Standards and Guidelines also include the Monitoring and Evaluation Program requirements (detailed in the Forest Plan, Chapter V) that serve as the enforcement mechanism for achieving desired future conditions.

The organization of this chapter is similar to that of Chapter III. Environmental components become the subject of analysis. The "existing condition" description of each component in Chapter III provides the foundation for the impacts discussed in this chapter. A thorough reading of Chapter III, Affected Environment, will improve the reader's understanding of material in this chapter. The structure of Chapter IV is designed to trace the natural progression of consequences (resulting from an agency action, such as road construction) through the physical and biologic components of the environment, ending with the social and economic implications of the action.

Each environmental component is introduced with a description of the significant interactions which summarize the relationship between site-disturbing activities and potential impacts on the component. The reader is encouraged to review the entire chapter in order to understand the complete ramifications of the proposed actions in this FEIS. Additional detailed information related to the analytic basis of the information is contained in Appendix B of the FEIS.

Several special summaries follow the disclosure of impacts by environmental component. A review of potential conflicts with plans and policies of other jurisdictions for alternatives considered in this FEIS is provided, followed by a discussion of the adverse impacts which cannot be avoided, the relationship between short-term use and long-term productivity, and the irreversible and irretrievable commitment of resources associated with implementation. Environmental effects or conditions common to, or unchanged by the alternatives, are also outlined. The chapter concludes with a series of specific disclosures required by NEPA and CEQ regulations for the proposed action.

Mitigation, as referenced in the above discussion of Standards and Guidelines, is extremely important in the design of the alternatives and during the implementation of any alternative. In general, "mitigation" is a measure taken to cause an action to become less harsh or less severe. From the CEQ Regulations (40 CFR 1508.20), "Mitigation" includes:

- Avoiding the impact altogether by not taking a certain action or parts of an action;
- Minimizing impacts by limiting the degree or magnitude of the action and its implementation;
- Rectifying the impact by repairing, rehabilitating, or restoring the affected environment.
- Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; and
- Compensating for the impact by replacing or providing substitute resources or environments.

In the design of alternatives in Chapter II and throughout the discussion of environmental consequences by resource component in this chapter, mitigation measures have been thoroughly incorporated and evaluated. For the actions analyzed in this programmatic EIS, both the means to resolving the issues (Planning Problems) and mitigation measures are primarily addressed through land allocations, standards and guidelines, and capital investments.

The mitigation measures discussed in Chapter IV are those that could be used in addition to those discussed in Chapter II if the risk of failure or potential consequences to the environment are high in a given alternative or if there are several unknowns.

How mitigation is used in this chapter is better understood if the concept is made clear. Some examples may help to highlight their use. Where a sensitive nest site of an eagle is known to exist, a guideline requiring that any proposed management activity remain at several hundred yards distance can be applied to avoid the potential disturbance of that site and its occupants.

Quite often soil and water improvements through capital investments are utilized in rectifying prior impacts (as in restoration of an old, badly eroding road) or in preventing erosion (such as grass seeding, mulching, or paving a newly constructed road). Programmed road maintenance for the level and type of use and other resource considerations is valuable in reducing many resource impacts while providing protection to the capital investment (the road itself) over the life of that facility.

Numerous examples of mitigations can be listed. However, if the use of land allocations, capital investments, and standards and guidelines are traced closely, the various forms of mitigation should be readily apparent.

Environmental Consequences of the Alternatives on Environmental Components

Geology

Introduction

From spectacular large scale mass movement to imperceptible creep of soils, geology intersects with management activities of the Mt. Hood National Forest. On the Forest, geologic impacts are primarily a result of slope instability that is reflected by the occurance of landslides. Slope failure of soil and rock can be caused by natural processes or as the result of management activities.

Impacts on earth flows are related to acreage disturbed. 46,000 acres of earthflows are located on the Forest. Many of the special emphasis watersheds contain deep-seated landslides (earthflows). Earthflow landforms present site-specific problems in resource management.

Related ICOs

- Future availability of rock resources
- Development of management direction for development of mineral resources.
- Management activities on land stability within large earthflows.

Significant Interactions

Soil moisture is increased when harvesting occurs, but water released on earthflows has a bigger impact than water released on other landforms. On an earthflow, water stays on the site longer due to its characteristically poor drainage. Water adds weight to the landform, reduces the strength of the unconsolidated landslide material and increases stress, increases pore water pressure in the soil mass and cuts away at the toe material. Any or all of these impacts can accelerate or reactivate earthflows. As more timber is harvested from earthflows the greater the risk of unstable land conditions on these landforms.

Developed recreation sites have at times been developed on unstable ground. Attendant facilities, road building and water well drilling could increase the concentration of water in one location which could activate or reactivate a landslide causing loss of property and perhaps lives. The management of developed recreation sites does not vary significantly by alternative so the effect of geology would be about the same in all the alternatives.

Construction of roads can have a number of effects on the stability of the slope. Excavation of a road prism removes toe support for soil about the cutbank, which increases the potential for slope failure. This "cut" material is usually added as "fill" on the slope just below the road. It adds weight to the slope. The fill material is inherently less stable than the natural underlying soil. It also increases the failure potential of the underlying natural soil from the weight of the fill plus the additional weight of the water it will absorb. Pressures within the soil profile are increased when soils are saturated by an increase in ground water. Road construction may divert and concentrate surface water, increasing erosion of ditches, slopes, stream banks, and channels.

Natural environmental phenomena as well as human activities affect the stability of slopes.

Activities like road building, rain on snow events, logging, development of recreation sites all directly affect slope stability. The degree of effect can vary greatly depending on location and design.

Other ground disturbing activities that can affect slope stability include (but are not limited to) wildfires, mineral exploration, fire suppression.

The loss of trees to fire would cause the same effect on slope movement as if the trees had been harvested. There is a change in hydrologic balance which may affect slope movement. If access is part of fire suppression this will affect slope stability by promoting the loss of slope stabilizing vegetation.

Mineral exploration can involve boring, digging, the use of explosives and access trails and roads. These produce a localized impact which may weaken an already unstable slope.

All these kinds of reactions have a direct effect on vegetation and soil productivity as well as the other resources that are part of or adjacent to these areas.

Direct and Indirect Effects

There are a variety of direct and indirect effects on the environment that result from geologic interactions. Some of the kinds of indirect effects associated with severe mass wasting and landslides can include:

- Loss of facilities and capital investments - (primary roads),
- Increased cost and personnel required for management of areas where acceleration has taken place,
- Increased risk of injury or loss of human life.
- Increased sediment to streams and reservoirs
- Visual impacts of landslide scars and deformed vegetation
- Loss of shading for anadromous fish streams.

Alternatives NC and C

These alternatives have the greatest harvest per decade and therefore the greatest potential and highest risk for initiating or reactivating mass movement of slopes and the kinds of direct and indirect effects associated with them. There would be an increase in need for mitigation

Table IV-1 Acres of Land in Earthflow Management by Alternative

Alternative							
NC	A	C	E	F	H	I	Q (Preferred)
0	0	0	17,800	0	11,600	16,650	25,800

techniques with the increase in road building and timber harvest. Loss of valuable resources through mass wasting, such as soil productivity and degraded water quality is high.

In this alternative there are no acreages designated as earthflow management areas. The standards and guidelines which this Forest will use try to maintain the hydrologic and physical balances in order to prevent reactivation or acceleration of large, slow moving earthflow areas.

In alternative C an average of 174 miles of new road construction will occur during the first three decades. This is more than two times the miles of new road constructed in alternative H. The potential for slope failure as a result of road building is much greater. All other alternatives have a greater average of new road construction for the first five decades than alternative H. Lower harvest in Alternative H means less of a chance to significantly impact unstable slopes.

Alternatives A and E

These alternatives have a moderately high potential for initiating or reactivating mass movement on steep slopes and/or earthflows. The estimated number of new roads for both range from an average of 142 miles in the first decade to 99 miles in the fifth decade.

Alternative A does not have any acres designated for earthflow management areas. There is a high risk for slope management due to resource activity. Alternative E does have 18,000 acres in earthflow management areas, through which the Forest will try to maintain the hydrologic and physical balances in order to prevent movement on these slow moving earthflow areas.

Alternative F

This alternative ranges from 22000 acres of timber activity in the first decade to 18000 in the fourth decade. Building of new access roads would range from 76 miles in the first decade to 70 miles in the fifth decade. This alternative would have less of an impact on slope stability than alternatives NC, C , A and E.

This alternative does not have any acreage designated to earthflow management areas. Risk of accelerating or reactivating slope failure due to resource activity is low.

Alternative H

This alternative favors slope stability the most. An average of 15,700 acres of timber activity in the first three decades is the lowest of all alternatives. Likewise, the estimated volume of new road construction is an average of 57 miles for the first three decades.

This alternative has 12000 acres designated to earthflow management areas. In these areas activity is modified to prevent an imbalance in hydrologic and physical properties of the slopes under resource activity. Risk of accelerating or reactivating slope failure due to resource activity is low.

Alternative Q

This alternative has 26000 acres designated to earthflow management areas. In these areas activity is modified to prevent activation or reactivation of mass movement on these slopes. The estimated volume of new road construction is an average of 147 miles for the first two decades. This alternative would have fewer impacts on slope stability than alternatives A, C, E, or NC. Risk of accelerating or reactivating slope failure due to resource activity is moderate.

Alternative I

There is an average of 75 miles of new road construction in this alternative for the first three decades. 17,000 acres of land are in Earthflow Management areas, these areas will be managed according to the standards and guidelines which were developed to help prevent the activation or reactivation of mass movement on earthflow lands. Risk of accelerating or activating slope failure due to resource activity is moderate.

Cumulative Effects

In all alternatives, activities such as the Forest's timber harvesting methods, road construction and silvicultural practices affect the rate and volume of rock and soil material displaced by mass wasting. Rapid increases in the rate and magnitude of soil movements can trigger a cumulative effects reaction.

The more timber harvested on earthflows, the greater the risk of triggering unstable conditions on these landforms. The alternatives present a range from moderately low to high risk of future cumulative effects.

Alternatives NC, C, A and E have the highest degree of risk in terms of causing cumulative effects. A moderate risk level is associated with Alternatives F and Q with Alternatives H and I posing a low level of risk in the future.

Mitigation

Where high risk potential or known areas of instability are located, the impacts of an activity can be mitigated by:

- Maintaining or improving surface drainage.
- Keeping road construction to a minimum.
- Avoiding areas where the activity would remove weight from the toe or add weight to the head of a slump or earthflow.
- Dispersing and reducing timber harvest in these areas.
- Replacing clearcut silvicultural prescriptions with partial cut prescriptions.
- Eliminating activities on slopes where such activities would likely cause irreversible resource damage.

Forest wide standards require the implementation of mitigation measures to reduce the impacts of management activities that may activate, reactivate, or accelerate soil movement in areas known to be unstable or with high risk potential. Where irreversible resource damage would occur due to timber activity, the areas have been removed from the landbase and are classified as land unsuitable for timber harvest.

Timber activity and access on all designated earthflow management lands (B-8) will be designed to maintain long term stability of the area. See the standards and guidelines in Chapter 4 of the Forest Plan for the Mt. Hood National Forest.

Earthflows require special management practices to reduce the risk of reactivation or acceleration. Mitigation will be accomplished through a uniform policy of earthflow management which reduces the risk that activities like road construction and timber harvest do not reactivate or accelerate earthflows. These policies have been designed to prevent an increase in, ground water to an unstable area or geologically weak structure, adding weight to the head of a slump, removing weight from the toe of a slump, and disturbing surface water flow. The problem of water yield on earthflows can be mitigated by planning, designing and constructing projects not to accelerate or activate an earthflow area. Adherence to these limits would reduce the risk of reactivating or accelerating earth movements.

The mitigation measures used on this Forest have been effective on moderate sized earthflows during the 1970s The larger earthflows, such as the Collawash are less responsive to individual measures.

Minerals

Introduction

Exploration and development of mineral resources on the Forest have varying effects on the environment. The potential environmental effects are dependent upon methods, duration, and extent of operations. Ground disturbance associated with mineral and energy activities can have important direct and indirect interactions with most of the environmental components described in this chapter. Conversely, land allocations designed to protect various resources from adverse effects of ground disturbing activities can constrain mineral exploration and restrict development to varying degrees.

The Forest policy is to encourage and facilitate mineral exploration and development on all lands not withdrawn from mineral entry. This policy would not change as a result of implementing any of the alternatives.

Under the various alternatives, certain lands are recommended for withdrawal from mining activity while other lands are recommended for management by various prescriptions. The way lands are managed under each alternative will have an effect on the availability of those lands for mineral entry. It will also have an indirect effect on the cost of conducting exploration, development and reclamation activities. Management prescriptions and the management of other resources may affect the actual cost of operation, the management approach may also influence interest in exploring some areas for their mineral resources.

The value of mineral resources is not well quantified. Therefore it is difficult to quantify the effects on minerals that each alternative would have in terms of dollars, tons at a certain grade or billions of BTUs Likewise, since specific activities have not been proposed the indirect effects of protecting other resources from mining impacts cannot be specifically quantified in terms of delays, cost of operating, cost of reclaiming or in terms of production. These impacts will be analyzed and quantified when specific activities have been proposed and the location, scope and timing of an operation is known. As a consequence, the effects are best shown by analyzing the relative degree to which management prescription may increase the cost of operating, limit the availability of lands for mineral exploration and development or constrain proposed mineral activities. Conversely the direct and indirect effects of minerals activities on other resources would be analyzed also.

The differences in access affect the availability of Forest lands for mineral exploration, development, and reclamation. In such cases potential mineral resources may never by identified or developed. When management goals for other resources cannot be fully met in conjunction with certain types of mineral activities, the result is a conflict of interests. Alternatives with highly restrictive access and smaller area disturbance would in general have lower environmental risks and levels of impact.

Minerals and mineral related resources are grouped into three basic categories: Locatable, Leasable, and Saleable Minerals.

Locatable Minerals

Most locatable mineral activity has occurred on the Oak Grove Fork of the Clackamas river. As described in the mineral section of Chapter III, operations in this mining district have been small and intermittent. The mineral potential of the District is moderate and concentrated primarily on the possible development of cinnabar (mercury ore). Except for the three mining districts on this forest, the forest is low in locatable mineral potential as discussed in the minerals section of Chapter III, DEIS.

Known locations of locatable minerals do not change with alternatives, but the availability for mineral exploration does (Table IV-1). The conflicts mentioned above could occur in areas where claims were made prior to mineral withdrawal, or where existing claims have been located in management areas subject to recommendations for mineral withdrawal. Highly restricted access due to management area direction can discourage exploration and development, mineral claims would be prohibited. Table IV-2 lists the locatable mineral acres in management areas by restrictive categories.

Because the mineral potential for locatable minerals is low, the likelihood of development is minimal for all of the alternatives. The acreage that would potentially be withdrawn from mineral entry varies slightly from one alternative to the next. Environmental consequences of the alternatives on mineral development would be directly related to the size and kind of area that would be withdrawn from mineral entry. The closing of roads for various resource activities could have an adverse impact on the access to mineral exploration; however the construction of roads for other resources could expose geologically promising strata to prospectors and increase access which would benefit mineral exploration and development activities.

Leasable Minerals

With a valid permit, people can explore for leasable minerals on all public lands not withdrawn from mineral leasing laws. In an area where valid existing mineral rights do not already exist, leases and permits may be granted under the provisions of all alternatives only if these leases and permits incorporate the management direction of the lease/permit area. If an area has been leased, the lessee has the right to explore, produce, and develop leasable minerals with reasonable access. Where other management goals cannot be completely achieved while leasing activities continue, conflicts may arise. Conversely, management prescriptions could impair access to leasable minerals. Impacts of management prescriptions could affect the type of mineral leasing activity permitted, the quality of information acquired about the potential and occurrence of the mineral resource, and the ability of the lessee to supply minerals to meet national demands.

Geothermal resources are considered to be a leasable mineral. Since no geothermal development has occurred (as of 1990), the probable environmental interactions of this resource with other resources and activities must be drawn from those in existing geothermal developments elsewhere in the western United States and the world. Exploration and development of geothermal energy is carried out largely by private companies under the Federal leasing program.

Experience indicates that only a small percentage of the leases are drilled and an even smaller percentage make a discovery and are developed. Activity on the bulk of the leases will not proceed beyond the preliminary exploration.

Saleable Minerals (Sand and Gravel)

As the need for additional rock resources develops, acreage will need to be set aside for them. Environmental consequences from development of new and existing quarries would result primarily from the particular location in relation to other resources as well as the number of acres available for new quarries, which varies slightly by alternative. The demand for additional quarries will be higher in alternatives where timber harvest levels are higher. The consequences are illustrated by analyzing how acre assignments to management areas may limit the availability of lands for minerals exploration and development or constrain proposed mineral activities.

Table IV-2 Acres Available for Mineral Exploration by Alternative

Mineral (Saleable)	Alternative (# Acres Available in 1000s)							
	NC	A	C	E	F	H	I	Q (Preferred)
Common Variety	.80	.74	.77	.72	.67	.42	.62	.69
Locatable	.76	.76	.79	.75	.75	.76	.75	.75
Leaseable	.85	.85	.88	.84	.84	.85	.84	.84

Table IV-3 Mineral Management Restrictions (1000 Acres)

Locatable Restrictions	Alternative							
	NC	A	C	E	F	H	I	Q (Preferred)
Withdrawn	.30	.30	.27	.31	.31	.30	.31	.31
Highly Restricted	.10	.05	.05	.05	.05	.03	.03	.05
Moderately Restricted	.0009	.05	.05	.07	.14	.13	.48	.13
Low Restrictions	.72	.65	.69	.63	.55	.46	.22	.57
Leasable Restrictions								
Withdrawn	.22	.22	.19	.22	.23	.22	.22	.23
Highly Restricted	.15	.10	.12	.12	.12	.11	.11	.15
Moderately Restricted	.0009	.71	.07	.09	.23	.13	.50	.13
Low Restrictions	.72	.65	.69	63	.55	.46	.22	.57
Saleable Restrictions								
Withdrawn	.26	.43	.48	.34	.83	.64	.43	.37
Highly Restricted	.06	.07	.19	.21	.20	.14	.19	.21
Moderately Restricted	.0	.0	.0	.02	.04	.02	.34	.04
Low Restrictions	.74	.14	.58	.49	.43	.26	.10	.44

The primary effects on mineral and energy exploration and development relate to land allocations and management direction that limit access to the resource and its availability for use. Depending on the alternative, management may tend to encourage or discourage exploration and development. Various restrictions have been placed on the resource in one of four restriction categories, defined as follows:

Withdrawn Lands. Withdrawn from mineral entry including statutory and administrative withdrawals and areas where preservation of other resource values requires subsequent withdrawal from mineral entry.

High. Lands where mineral activities are permitted but administrative designations or statutory or regulatory designations preclude or highly restrict access and/or ground disturbing activities due to resource constraints. Also included are lands where some or all of the mineral rights were retained by a prior landowner. Leases would usually contain stipulations precluding surface occupancy.

Moderate. Lands where management designations or other resource considerations require special mitigative measures. Special lease stipulations or plan of operation considerations are needed to accomplish resource coordination.

Low. Lands where management designations would not require special mitigative measures over extended areas. Restrictive lease stipulations or operating conditions may be required to mitigate site specific resource coordination needs. Standard field practices for mining and mineral lease activities can generally be utilized.

Related ICOs

- Development of management direction for exploration/development of minerals

Significant Interactions

Because laws govern all planned management activities, the only variable for minerals management is the potential to locate and develop minerals. Alternatives calling for greater harvest and road construction levels and more dispersed recreation will increase the potential for locating minerals.

In general, the relationship between the Forest's road system and mineral resources is a positive effect. Common variety mineral resources provide the materials from which roads are constructed and maintained, whereas the road system provides access for mineral exploration, development and production activities. On the Forest, the dominant market for construction materials is in support of the timber management program.

Differences in alternatives are caused when the need for additional access is low, is highly restricted, or development and extraction is prohibited.

The manner in which lands are to be managed under each alternative will have an effect on the availability and level of restrictions on these lands for mineral entry; it will also have an effect on the cost of conducting exploration, development and reclamation activities. Under the various alternatives, certain lands are recommended for withdrawal from locatable and saleable mining activity. Implementation of the Forest Plan may preclude future exploration and development in certain areas recommended for withdrawal. Management prescriptions may also affect exploration for mineral resources in some areas.

The potential for direct effects on minerals can occur in Research Natural areas, because of the potential conflict with sensitive plants and unique plant communities, this allocation imposes high restrictions relative to access and development. If protection could not be assured during mining, the need for withdrawal will be considered through an environmental analysis on specific operating plans.

Existing RNA's are withdrawn from mineral entry. Impact on the non-wilderness potential areas will not vary significantly by alternative.

Allocations to or designations of Wild, Scenic or Recreation Rivers will have a significant direct effect on mineral activities due to high or withdrawn access restrictions. Allocations to Wild River will result in the withdrawal of land from mineral activities within 1/4 mile either side of the river. In some cases, withdrawal may be recommended in Scenic segments. Protection of visual resources on lands adjacent to the 1/4 mile corridor may impact mineral activities on much larger areas due to public demand for protection of those areas. Development of reservoirs and powerlines, and other types of intensive use, are generally not permitted on Wild portions of Wild and Scenic Rivers. Removal of sand and gravel will be prohibited. Direct and indirect environmental effects on these areas would be minimal because of the access restrictions.

In all alternatives, the acres of wilderness have already been withdrawn. The mineral operations allowed within these areas are those authorized by valid existing rights perfected prior to the area's withdrawal as wilderness. There is a low potential for identifying mineral resources.

Direct and Indirect Effects

There are no known indirect effects on Land Ownership and Use from changes in Minerals in any of the alternatives.

Alternative NC and C

These alternatives have the largest timber harvest per decade and the greatest number of new road construction miles. About 283 miles of new road in the first decade will benefit mineral exploration and development.

Alternative NC has the lowest level of management therefore is the most flexible for mineral exploration. Alternative C has the greatest number of acres available for locatable and leasable mineral exploration.

These alternatives will have a higher potential for site disturbance and environmental impacts.

Alternatives A and E

Existing locations for mineral exploration and development will be maintained as is presently. Alternative A has the most number of acres managed for general riparian, this will limit the availability of riparian lands for placer exploration or common variety mineral exploration and development. Both Alternatives A and E have 48% of Forest available for exploration and development of saleable minerals, 78% available for leasable mineral exploration and alternative E has 69% of the Forest lands available for locatable mineral exploration with an average of 630,000 acres of land with low restrictions on mineral management. The potential for environmental impacts under these alternatives is expected to be in the low to moderate range.

Alternative F

Existing locations for mineral exploration and development are restricted. This alternative has an average of 80 miles per decade of new road construction for the first 5 decades. There are 43% of Forest lands available for saleable mineral exploration and development with 430,000 acres of land with low restriction for saleable mineral management. This alternative has the most number of acres withdrawn from saleable mineral exploration. Ther is 69% of Forest land available for locatable mineral exploration with 550,000 acres with low restriction for management. There is 77% land available for leasable mineral exploration with 550,000 acres with low restrictions for management.

Alternative H

Under this alternative there is 71% of Forest land available for locatable mineral exploration and 79% of Forest land available for leasable mineral exploration. There are 460,000 acres with low restrictions for management.

This alternative has the least number of new road construction per decade for the first five decades, which would limit access for mineral exploration. This alternative is one of the most restrictive for saleable mineral exploration with 640,000 acres withdrawn from saleable mineral entry.

Alternative I

After the first decade of management under this alternative Rock resources would diminish greatly. Very few locations would exist where mineral exploration and development were not highly restricted.

This alternative does not favor mineral exploration and development.

Alternative Q

This alternative is no more or less restrictive to minerals than Alternatives E, C, and F. Mineral exploration would be somewhat restricted with over 300,000 acres withdrawn from mineral entry.

Cumulative Effects

At this time it is not known where, when, or what type of hydroelectric project might be applied for a given area, it is not possible to quantify the anticipated environmental impact that future proposals of this nature might have on minerals availability.

Mining activities could influence the location of proposed new trails. Existing facilities would be protected through mining operation plans. Alternatives with the greatest number of trails will have the greatest risk of impact.

In general, existing Forest roads and trails on the Mt. Hood National Forest have been adequate to satisfy the access requirements for the level of exploration activity conducted during the past 10 years. Whether the system remains adequate will depend on the results of recent and future exploration. In most cases, when access is needed for mineral-related activities, it can be developed so that it is compatible with the Forest Service road system. However, the holder of a valid mining claim has a statutory right of appropriate access to the claim. The claimants road needs may not always be compatible with planned or existing systems. In such cases, the incompatibility will be mitigated to a reasonable extent through an approved plan of operation, while recognizing the rights of the mining claimant. This is constant through all of the alternatives.

Mineral exploration and extraction, and geothermal exploration can result in damage and /or obliteration of existing roads if sites are adjacent to or within roadways. If a significant ore body were discovered, a large increase in use of the affected road system would result. The actual amount of development is beyond the control of any alternative, as existing mining laws and regulations take precedence. However, the alternatives vary in their degree of restrictions, the alternatives that have the most highly restrictive acres would be the least favorable to development.

Mitigation

Under all alternatives, threatened and endangered plant and wildlife species would be protected to the extent required by law, as would flood plains and wet lands. Potential damage to archaeological and /or historic sites would require mitigation avoidance by the prospector or miner. Protection of surface and subsurface waters from contamination would be required, as would maintenance of air quality. For each mining development, a Plan of Operation would be prepared and submitted to the Forest Service for approval, per 36 CFR 228 The plan of operation would incorporate these requirements and others as needed, as well as identify how each requirement would be met. All mitigation costs would be borne by the proponent.

Proposals for mineral exploration and development are considered on a case-by-case basis. When a proposal is received, the Forest Service can work with a proponent and other agencies to minimize or mitigate adverse impacts on those resources requiring some degee of protection. Only reasonable restrictions to mining can be legally imposed on areas not withdrawn.

An example might be a proposal to drill in a Research Natural Area, Botanical Interest Area, or Special Interest area. Sensitive plants are known to inhabit such areas. In order to protect the plants, the operator may be required to drill from an off-site location.

Potential Conflicts with Plans and Policies of Other Jurisdictions

Please refer to the end of this chapter for a discussion of the possibility of conflicts between the alternatives and the plans and policies of other jurisdictions with responsibility or authority for this environmental component.

Energy

Introduction

The potential geothermal and potentially hydroelectric power development were not quantified. These sources will probably add to the long-term energy output of the Forest in any alternative

Related ICOs

- Development of management direction for exploration and possible development of energy resources.
- Development of management direction for small hydropower development

Significant Interactions

The significant effects on nonmineral energy are a result of :

- The different harvest levels of the alternatives which affect the amount of fuelwood generated as well as the energy required to implement the alternative; and
- Land allocation and associated standards and guidelines changes by alternative that affect hydropower development potential.

Direct and Indirect Effects

Effects on fuelwood and direct effects on hydropower result from the changing of land allocations by alternative and the standard and guidelines have the effect of restricting access.

The indirect effects on fuelwood result from residue of timber harvest and , as harvest levels fluctuate, cords of fuelwood change.

Cumulative Effects

No significant effects are expected for fuelwood.

Soil Resources

Introduction

Soils represent a complex system where the biological and nonbiological ecosystem components meet and interact on one another. In this environment many biological processes influence one another in creating a balanced system dependent on this intricate weave of nature. The complexity of the soil system makes it difficult to identify and quantify possible effects of disturbances on the functioning of the soil system. The effects of disturbances on the soil system is related to the resiliency of that soil to maintain functioning of important processes. Because soil forms during a slow weathering process from rocks, soil is not considered a renewable resource.

Changes in the productive qualities of the soil resource have been related to disturbances arising from management actions on the ground. The magnitude of change is associated with the type of disturbance, the size or extent of the affected area and inherent soil properties governing productivity. Erosion, nutrient loss, mass movement (landslides) and compaction, the compression of soil into a smaller space, are effects associated with management induced changes to soil. Additional discussion about erosion and landslides may be found in the Geology Environmental Component of this Chapter. Declines in productivity occur due to alterations of the complex nutrient cycling system as is the case with broadcast burning. Other disturbances affect the physical characteristics of the soil resource. Compaction and surface erosion are examples of disturbances that modify the moisture storage capacity of soil, reducing growth moisture available for seedlings.

Physical disturbances related to log harvesting practices may increase surface erosion rates by exposing the soil surface or reduce the growing potential by compacting the soil. Tractor harvesting operations and machine piling of slash produce these types of disturbances. The use of fire to reduce fuel build up increases soil exposure and reduces surface organic matter. Nitrogen, considered a limiting nutrient to Douglas-fir growth, is lost to the atmosphere when organic matter is consumed by fire. Some activities, like fertilization,improve soil productivity over a short period of time. The construction of roads often represents a permanent loss of soil productivity.

With timber harvest and removal of the conifer canopy changes occur in the natural forces regulating slope stability. Higher levels of rainfall reaching the soil increase soil pore pressures while the resistant forces of live tree roots result in an increase in mass movement. Construction of roads can alter natural forces of slope stability and promote increases in the rate of mass wasting in naturally unstable soils. More discussion on mass wasting is presented in the geology section of this chapter.

Related ICOs

- Rehabilitation and restoration of long term site productivity.
- Management activities that may cause unacceptable soil movement.

Significant Interactions

Timber Harvest

Soil compaction and erosion result directly from disturbances related to timber harvest. During harvest changes to the soil surface result from the dragging of logs over the ground or from tracked equipment that transport the logs. The type and extent of soil disturbances is related to the logging system used in the harvest operation.

Ground based equipment, used primarily on slope gradients less than 30 percent, compact the soil along travel routes and expose soil, increasing the susceptibility for erosion. Cable logging or in special situations aerial systems are planned on slopes over 30 percent. Soil erosion is the dominant effect associated with cable systems. The extent of disturbance from cable harvest is dependent on the degree of suspension of the log payload. When significant resource values need protection or harvest is occurring on steep slopes greater suspension of logs is achieved.

Layers of the surface soil where skid trails are used typically exhibit reduced macropore space, reduced infiltration capacities and increased bulk densities. Seedlings growing in densely compacted soils show lower growth rates compared with seedlings growing in undisturbed sites. Researchers have identified a relationship between soil bulk density increases and decreases in tree growth. The magnitude of productivity declines is difficult to quantify due to interaction of growth factors. Growth reductions in research studies vary from 14 to 73 percent for Douglas-fir and 6 to 53 percent for ponderosa pine.

Timber harvest removes large logs from the activity site. In addition to removal of the standing trees harvest also includes trees that had fallen and were apart of the forest floor. Recent findings suggest that large woody material is a conduit for maintaining healthy ecosystems by providing habitat for small mammals, acting as a substrate for beneficial fungi and serving as a nutrient storage sink over long periods of time (Harvey, 1978 and Maser et al., 1984). Current knowledge is not sufficient to answer all the questions regarding the amount of material that should be left to meet long term productivity needs.

Roads (Also see the Improvements component of this chapter).

Construction of roads has the greatest impact on the soil resource. Road construction requiring excavation of the soil mantle permanently reduces the productive capability of soil, including the road surface area and the cut and fill slopes. When levels of vegetation cover are not adequate to stabilize the soil surface rates of erosion remain high for extended periods of time. On steep slopes road cut areas are large and difficult to revegetate where excavation has exposed bedrock. The productive capacity of road surface can be recaptured through rehabilitative measures. The degree to which soil productivity is recaptured is dependent on the depth of excavation for road surface location and soil depths.

Erosion from cut slopes and increases in mass movement associated with the slope destabilizing effects of roads are contributors of sediment to stream system (Fredridsen, 1970). Dirt road surfaces, and cut and fill slopes, when not effectively revegetated, continuously erode delivering soil particles to road ditches and stream systems. Roads built on the steepest slopes have the greatest area in cut and fill slopes and the highest rates of erosion. The density of roads (miles of road per square mile) is a function of topographic features and the type of logging system utilized in harvest. Higher road densities are associated with ground based and high lead logging systems, lowest densities occur with skyline and helicopter systems.

Road construction has the potential to destabilize slopes, promoting mass movements. The rates of acceleration depend on natural stability characteristics of the land unit, slope gradient and slope hydrology. Higher rates of mass movement occur on steep slope gradients, in pyroclastic parent rocks and where slope drainage funnels moisture to the contact between soil and geologic rock. A loss of site productivity results from mass movement. (See discussions under the Geology Component).

Logging Residue Management

The extent of residue management is determined in part by silvicultural and fuel treatment objectives. Treatment options include machine piling, broadcast burning, hand piling and yarding unutilizeable material.

Machine piling, involving crawler tractors, has the greatest potential to harm the soil resource by compacting soil, removing nutrient enriched surface organic or mineral soil layers and exposing the soil surface to agents of erosion. Machine piling often results in the entire harvest area being travelled over. An increased use of smaller track hoe and shovel equipment in piling operations has resulted in less impacts to the soil resource from machinery operation.

The amount of surface organic matter consumed during broadcast burns is a concern for continued fertility of the site. Important nitrogen reserves are held in the surface litter layer which are volatilized with fire. Because nitrogen is a limiting nutrient for Douglas-fir growth the concern is not to have hot fires that totally consume the surface litter layers and transfer heat into the upper soil surface layers. Prescribed spring fires are typically low intensity burns that expose only small areas of soil.

Another fuel treatment tool is the removal of unmerchantable material from harvested areas. This resource has value as large woody material for long term productivity. Removal of this material may reduce levels of large woody debris on the site below levels capable of sustaining long term productivity. The more material removed the greater the concern for productivity.

Developed Recreation

Recreation impacts to soils typically occur on site and are relatively small in size. The concern is where recreation impacts are cumulative to other management actions. Erosion and compaction result from recreation activities. Erosion occurs during the construction phase of recreation projects and is ongoing from compacted trails and recreation sites. Because many recreation activities occur around water, surface and subsurface drainage restrictions may create erosion especially on trails and campgrounds where foot traffic has compacted the soil surface. Compaction and erosion is a greater concern where poorly drained soils are involved. Construction of recreation facilities often occur at the expense of soil productivity.

Dispersed Recreation

Impacts to soils from the dispersed recreation include compaction, erosion, soil displacement, reduced vegetative production and dedication of the soil resource to nonproductive uses. Unplanned recreation possesses a higher potential for soil displacement, erosion and sediment delivery to stream systems. Location of use sites adjacent to wet areas and riparian zones increase compaction damage and sediment delivery. Unplanned trails on steep slopes are areas of high erosion.

Use of the land by off-road-vehicles has a significant impact on the soil resource. Trails created by vehicles produce compaction. The loss of the vegetative layer exposes soil to surface erosion. Unplanned location of roads adjacent to streams or in ephemeral channels increases sediment delivery rates.

Range

Effects from cattle grazing tend to be localized. Use of areas by cattle early in the spring when soils are high in moisture or in areas where soils are seasonally wet will result in compaction of the surface soil layers. The magnitude of the impact is greater where the concentration of animals is higher or when the period of use is long. Reduced infiltration rates in compacted areas will result in increased surface erosion and, due to proximity to streams, a higher likelihood of delivery to streams.

Trafficking by cattle breaks down protective vegetative cover and mechanically displaces the soil surface along stream side slopes. The slope destabilizing effect of trampling promotes erosion and sediment delivery in the riparian zones of streams. Trafficking on steep side slopes creates a series of small benches (terracettes) by mechanical displacement of soil and compaction by cattle hooves. Soil productivity is lost from the area of terracettes.

Fisheries

Soil disturbances from habitat improvement projects in streams have the potential to increase delivery of sediment to streams. The impacts will be located at equipment access points and where logs or boulders imbedded in the stream bank are moved or anchored. The small size of the disturbed areas will not result in long lasting impacts.

Wildlife

A beneficial interaction exists where wildlife improvement activities prescribe grass seeding in harvested areas or willow and alder plantings along stream sides. Rapid revegetation holds soil particles in place and promotes nutrient cycling.

Energy

Potential exists for development of geothermal and small hydroelectric energy sources on the Forest. During exploration activities there is a potential for erosion from construction related disturbances. Due to the intensity of development there is a loss of the productive capacity in the drill site area. The small size, approximately one acre, of exploration sites minimizes the impacts. Additional erosion and productivity impacts from facilities and transmission corridors would result if development of the geothermal site occurred.

Small hydrologic projects create the impacts of erosion, sediment delivery and loss of land productivity. Construction activities for diversions and penstock will result in soil disturbance and sediment delivery. Location of activities in the stream course would impart a high likelihood of sediment delivery. Construction of the generation facilities would remove productive land from future timber growth. A malfunction of the penstock resulting in a rupture would result in gully erosion and sedimentation of stream systems.

Minerals

Development of mineral sites has been confined to excavation of rock for road construction. Productivity of the site is lost when development occurs. Where developed sites promote channelling of water, off site erosion and possible sedimentation of streams can result.

Water

High energy hydrologic events characterized by high hourly rainfall rates or rapid melting of snow packs have the potential to detach and transport large quantities of soil material. Erosion rates are dependent on the soil properties, slope gradients and the area and configuration of soil exposure. Erosion rates from exposed road surfaces would be high. Gullying and rilling could result from high rainfall events. Reduced infiltration rates in compacted soils would result in higher rates of erosion. Increases in surface runoff from compacted areas has a similar potential as roads to deliver sediment to streams. In areas where hot prescribed fires have produced surface water repellent layers below the soil surface, rates of surface erosion will be greater.

The size of soil particles is closely related to sediment delivery. Because smaller sized soil particles are transported farther distances in overland surface flow soils which have a high percentage of such particles have a higher potential of increasing turbidity levels.

Vegetation

Management activities will cause disturbances in the soil surface that will result in changes in the type of vegetation that reestablishes or in a lack of vegetative establishment The greatest changes in vegetation will occur on road surfaces and associated cut and fill slopes. The removal of soil and replacement with rock surfaces will eliminate vegetation from the road prism. Natural vegetation growing on cut and fill slopes will have lower vigor. Seeding of grasses for erosion control purposes occurs on road cut and fill slopes.

Temporary spur roads and roads no longer needed in the transportation system can be cultivated and revegetated, yet the growth qualities of the soil can not be total restored. Subsequent growth in vegetation will not reach natural levels of production.

On hot, dry sites surface evaporation rates are increased when protective litter layers are removed. The advance of vegetation establishment is slowed on disturbed areas where surface soil temperatures are warmer and less growth moisture is available to plants.

Disturbances associated with timber harvest and site preparation disturbances favor the establishment of pioneering plants on the site. In the case where nitrogen fixing species of red alder and Ceanothus revegetate the site increases in soil nitrogen levels will result. Often this vegetation stage represents a period of building soil productivity.

Visuals

No effects of visuals on the soil resource

Research Natural Areas

No effects on the soil resource from Research Natural Areas.

Roadless Areas

The decision to enter roadless areas with roads and harvest would have the same effect as management actions on intensively managed lands. Some productive land would be lost to new road construction. Erosion from exposed road surfaces would have the potential to enter streams systems.

Wild and Scenic Rivers

Wild and Scenic River recommendations afford more protection for the soil resource by restricting management actions that would result in disturbance. Road construction and timber harvest would be restricted in study corridors. The Wild sections of river courses would receive the greatest protection from management activities. A lower level of protection would be provided by a Scenic designation. A Recreation designation would allow the most development.

Air

Significant effects of air quality on the soil resource are not anticipated.

Watershed Improvement Projects

Improvement projects seek to correct degraded soil conditions of erosion, sediment delivery and compaction associated with management activities. Improvement measures include gully stabilization, erosion control seedings, structure placement road obliteration. The alternatives do not vary in the scheduling of improvement projects.

Environmental Effects

Direct, indirect, and cumulative effects on soils are created mainly by timber harvesting and road construction activities. Tables IV-4 and IV-5 show the range of acres harvested and miles of road construction by alternative and time period. These values were used to determine the effects and sediment indexes discussed in this section.

The sediment index is precisely that, an index, but it is useful as a broad indicator of roughly how much erosion is happening in a given area. The index reports in thousands of tons of delivered sediment and therefore appears to be an output, but in reality its function is as an index, not a true sediment value. As a relative measure of sediment produced and delivered to streams, the sediment index consists of two parts. One part is the potential for soil to erode; that is its erodibility coefficient. Soil erodibility hazard was determined from an empirical model, the modified soil loss equation. This model evaluates factors of rainfall energy, inherent soil erodibility, slope characteristics and vegetation cover in deriving an estimate of soil loss related to ground disturbance. Management practices of road construction, logging system type and site preparation treatment were evaluated by the model for erosion production. Erosion was allowed to accumulate in the subsequent years following disturbance until recovery occurred. The second part is the potential for eroded soil to be delivered to streams as sediment - the delivery coefficient. Forest specific information regarding efficiency of sediment delivery is unavailable for silvicultural activities. Regression analysis from interpretive studies and research data were incorporated in the development of sediment delivery coefficients. Coefficients of delivery reflect types of silvicultural treatment and slope gradient. A more complete discussion of the sediment index model can be reviewed in Appendix B. The index does not include the possible contributions of destabilized earth flows, or any reduction in sediment delivery due to riparian management practices. The activity sediment delivery-index is a model that has been used to help assess impact trends between alternatives. However, the model was not designed to determine absolute effects of alternatives.

A "background" sediment coefficient was also established for all unharvested areas. This coefficient estimates soil material delivered to the stream system from natural phenomena. This value was extrapolated from scientific studies conducted on soils and topography

Table IV-4 Timber Harvest by Alternative

	Alternative							
	NC	A	C	E	F	H	I	Q (Preferred)
Final Harvest (M acres)								
Decade 1	43	32.6	39.6	45.4	21.7	15.2	23.1	29.4
Decade 2	41.0	30.9	36.9	36.6	21.4	15.6	22.3	27.7
Decade 3	37.9	28.7	34.3	35.5	23.6	16.3	21.6	27.3
Decade 4	38.8	32.6	36.1	25.5	18.0	12.2	28.0	26.3
Decade 5	40.7	30.7	37.7	26.2	19.2	14.3	17.2	24.4
Decades 1-5	201.6	155.5	184.5	169.2	103.9	73.6	112.2	135.0
Commercial Thinning								
Decade 1-3	0	0	0	0	0	0	0	0
Decade 4	6.7	5.7	7.8	5.3	4.3	3.8	4.2	4.5
Decade 5	29.3	24.8	28.7	24.4	18.8	16.6	19.3	21.7
Decades 4-5	36.0	30.5	36.5	29.8	23.0	20.4	23.5	26.2

Table IV-5 New Road Construction by Alternative

	Alternative							
	NC	A	C	E	F	H	I	Q (Preferred)
Miles of Road Construction								
Decade 1	247	255	309	304	113	74	115	166
Decade 2	159	125	172	149	87	75	87	128
Decade 3	81	82	80	75	97	71	83	90
Decade 4	102	71	77	36	59	50	105	78
Decade 5	90	62	67	46	45	59	43	65
Decades 1-5	679	595	705	610	401	329	433	527
Acres Affected								
Decade 1	419	433	524	516	192	126	195	282
Decade 2	153	105	114	78	76	100	73	110
Decades 1-5	1,152	1,010	1,196	1,035	680	558	735	894

Table IV-6 Index of Delivered Sediment

	Alternative							
	NC	A	C	E	F	H	I	Q (Preferred)
Delivered Sediment (tons)								
Decade 1	196	140	164	185	94	69	98	111
Decade 2	197	135	151	145	87	63	84	104
Decade 3	152	119	147	143	92	59	86	104
Decade 4	151	151	146	127	88	58	103	106
Decade 5	216	155	208	143	106	82	107	119

similar to those found on the Forest. The "background" sediment value was added to the activity-sediment index to arrive at the total sediment-delivery index presented in Chapter II, Table II-15.

Direct and Indirect Effects

Alternative NC

Scheduled timber harvest and road construction activities in alternative NC exceed all other alternatives. Soil disturbances from 43,200 acres of timber harvest (Table IV-3) and about 247 miles of road construction (Table IV-4) created 196,000 tons of sediment (Table IV-5) in decade one. In decade four management actions will produce 151,000 tons of sediment. Sediment levels increase to 216,000 tons in decade five, reflecting disturbances from commercial thinning harvest of 29,300 acres in the decade. The values indicate that the greater the acreage of managed land the greater will be soil disturbance and sediment delivery. This and other alternatives that require more acres of land to be harvested, also tend to operate on some lands that have higher erosion and stability risks.

The analysis of compaction draws upon the simple relationship that the greater the number harvested acres the greater will be the chance for compaction resulting from tractor harvest. In this alternative 43,200 acres are harvested in decade one, by decade 3 harvest levels fall to 37,000 acres. The highest levels of compaction will occur in decade five when 29,300 acres of commercial thinning will be accomplished in addition to 40,700 acres of final harvest.

Road construction mileage for the alternative is about 679, representing approximately 1,152 acres of land removed from biomass production.

Alternative A

Harvest of timber, road construction and site preparation activities in the first decade produced 140,000 tons of sediment. The index number declines to 119,000 tons in the third decade and increases to 155,000 tons by the 5th decade. The pattern in sediment production reflects an increase in thinning harvest acreage in the decade five.

Compaction from final timber harvest activities will be highest in the first decade when the total acreage harvest is 32,000. Impacts from compaction remain constant until decade five when 24,800 acres are scheduled for commercial thinning. A lack of geographic locatibility does not allow a more specific analysis of compaction effects.

Road construction mileage is about 255 miles in the first decade. Total road construction for the alternative is 595, converting 1,010 acres to a nonproductive status.

Alternative C

Sediment delivered to streams from timber harvest and road construction activities in the first decade is 164,000 tons. Road construction in the first decade is about 309 miles. The lowest delivery value occurs in decade four, 146,000 tons, and increases to 208,000 tons by the fifth decade. Total delivered sediment from management actions in alternative C is 816,000 tons.

With this alternative soil impacts due to compaction remains nearly the same through four decades. In decade one harvest level is 39,600 acres and in the third decade declines to 34,300. The combined harvest acreage, including final and thinning, in decade five increases to 66,400 acres. Disturbances from commercial thinning begin in the decade four.

Total road construction for the alternative is about 705 miles. Approximately 1,196 acres would be removed from productive status.

Alternative E

First decade sediment production is highest with this alternative, delivering 185,000 tons as a result of 45,400 acres of harvest and about 304 miles of road construction. A decline in second and third decade harvest levels results in delivery rates of 145,000 and 143,000 tons, respectively. Sediment production declines further in decade four, but increases to 143, 000 tons in decade five as commercial thinning harvest increases to 24,000 acres.

Compaction effects to soils will occur on acres treated with ground based equipment in harvest and site preparation activities. In alternative E compaction levels will be greatest in the first decade as 45,400 acres are harvested. Compaction is expected to decline as harvest levels decrease to 36,600 acres in decade two. Effects from compaction will increase in the fifth decade as the combined final and thinning harvest acreage increases to 50,620.

Road construction in the first decade will be about 304 miles. The total acreage value committed to roads with this alternative is 1,035 acres.

Alternative Q

Ground disturbance activities in the first decade of this alternative produce 111,000 tons of sediment from 29,400 acres of timber harvest and about 166 miles of road construction. Sediment yield declines to the lowest level in decade three and then increases to 119,000 tons in decade five. Decade five increases are attributable to increases in the commercial thinning harvest to 21,700 acres.

A portion of the 29,400 acres harvested in decade one will be compacted. Compaction impacts decrease gradually until decade five when final harvest and commercial thinning activities are scheduled on 46,100 acres.

Road construction mileage in the first decade is about 166. Total road mileage for the alternative is 527, removing 894 acres from productive status.

Alternative F

Restrictions on timber harvest imposed by visual management objectives in Alternative F resulted in lower soil disturbance from timber harvest and road construction. Sediment delivery reflects this lower management activity. First decade delivery recorded 94,000 tons of sediment throughout the Forest. Sediment levels remain below this level for the next three decades and increases to 106,000 tons in decade five as commercial thinning and final harvest acreage increases to its highest level.

Declines in soil productivity attributed to compaction will be greatest in decade five. Final harvest and commercial thinning levels are 19,000 and 18,800 acres, respectively. Harvest levels and compaction impacts are constant for the first four decades, with decade one exhibiting 21,700 acres of timber harvest.

Miles of road construction is 113 in the first decade and about 401 miles for the five decade period. The five decade road mileage will remove 680 acres from timber production.

Alternative H

With this alternative delivered sediment is highest in decade five, with 82,000 tons delivered from harvest and road building activities. Disturbance and sediment numbers are elevated in decade five by increases in commercial thinning harvest acreage. Delivered sediment is 69,000 tons in decade one, declining to a level of 58,000 tons in decade four.

Compaction effects are anticipated on a portion of the 15,200 acres of harvest scheduled in the first decade with this alternative. Lowest compaction impacts occur in decade four. Compaction damage will be greatest in decade five when combined final and thinning acreage is 30,900.

Total miles of new road construction will be 329. Approximately 558 acres will be removed from a productive status.

Alternative I

Sediment delivered from management actions totalled 98,000 tons in decade one of this alternative. Highest delivered sediment value, 107,000 tons, occurs in decade five. Intermediate values occur in decades two and three.

Compaction impacts in the first decade are expected on a percentage of the 23,1000 acres scheduled for harvest. Compaction damage remains constant through the third decade and then increases in decade four due to an increase of final harvest to 28,000 acres. Compaction damage declines in the fifth decade in response to decreases in final harvest acreage.

In the first decade 115 miles of new road construction are scheduled. Total road construction for the five decade period is anticipated to be 433 miles. Acres dedicated to roads will be 735.

Cumulative Effects

Impacts to soil productivity occur on site. Off site effects occur when eroded material or mass movements deliver material to stream systems. There are no impacts to the soil resource from off Forest management activities.

Separate management actions prescribed on the land have the potential to create soil disturbances that are additive in their effects on soil productivity. Compaction disturbances attributable to site preparation would be in addition to compaction damage occurring from tractor harvest operations. Productivity reducing effects of broadcast burning would also be cumulative to compaction damage on the site.

Erosion and compaction impacts are localized and typically noncontinuous in pattern. Vegetative recovery from soil disturbance can occur in a three to five year period on west side plant communities. For the drier east side plant communities vegetative recovery may require seven years.

The length of time natural forces need to act to restore compacted soil to natural bulk densities is not known. In environments where freeze thaw action is present the upper four inches of the compacted zone is known to return to precompacted conditions. In more moderate climates freeze thaw action does not act to alleviate compaction. In western Oregon studies indicate that on compacted areas little change occurs in soil densities after 32 years.

Commercial thinning entries, accomplished with ground based equipment, have the possibility of adding to existing compaction damage from previous final harvest activities if thinning occurs within a 50 years of final harvest. Compaction from successive thinning entries is also cumulative in nature.

Cumulative effects to soil productivity will be greatest with those alternatives that schedule the largest timber harvest and road construction program. With higher harvest levels there will be a higher acreage of compaction produced by tractor harvest operations, more acres impacted by soil erosion and fire effects and greater need for road construction. Higher harvest levels will result in more acres receiving site preparation treatment removing large woody material important for ecosystem stability.

Greater cumulative effects to soil productivity are anticipated from Alternative NC, which schedules final harvest and commercial thinning acreage of 201,600 and 36,000, respectively. Greater cumulative effects are anticipated from combined timber harvest and site preparation activities and from multiple timber harvest entries occurring with thinning treatments.

Alternative H schedules the lowest level of timber harvest. Final harvest and thinning harvest totals 73,000 and 20,400 acres, respectively. A smaller acreage will receive detrimental disturbance from management activities and fewer acres will be treated with multientry thinnings.

Alternatives Q and I are intermediate in their management proposals for harvest activities and will exhibit cumulative effects similar in relative ranking.

Mitigation

Specific Standards and Guidelines, presented in Chapter IV of the accompanying Forest Plan, address the management concerns related to compaction, erosion and organic material. The intent of the standards is to place thresholds on acceptable resource impacts for compaction, erosion and broadcast burning and provide for rehabilitative treatments if detrimental soil damages exceeds the threshold value.

Compaction. Soil productivity is protected by a management guideline establishing 15 percent of the activity area as the maximum amount of detrimental soil damage allowable from harvest activities. Mitigating measures of designated skid trails and tracked loader harvesting when properly applied will limit ground based harvest activities to 7 to 15 percent detrimental soil damage (information from compaction monitoring data). Monitoring data indicates machine piling contributes an additional 5 to 10 percent compaction. When machine piling is prescribed as the site preparation treatment in tractor harvested areas there is an increased possibility that greater than 15 percent of the area will be compacted, triggering the need for rehabilitative mitigation. Documentation is lacking regarding the quantification of cumulative effects of thinning entries occurring 40 years after final harvest activities.

Information developed from monitoring will reveal the combination of management activities that will exceed the 15 percent soil damage guideline. Implementation monitoring will be conducted to evaluate the need for rehabilitative treatments for prescription mixes with potential to exceed soil productivity standards.

In addition to Standard and Guidelines other management practices have been used to reduce the amount of compaction in harvested units. Other measures include 1) avoidance of the impact by harvesting with cable logging systems, 2) limiting tractor harvest to periods when soil moisture is relatively low, 3) requiring cable harvest methods in soils where a high compaction hazards exist,

4) prescribing low-ground-pressure tracked vehicles and 5) 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. These methods, especially hand-piling, are costly, and broadcast burning may have impacts on soil fertility, air quality, and fire risk.

The effectiveness of these mitigation techniques is poorly understood, with lack of data hampering a concise rating of mitigation success. Techniques which are thought to be highly effective include limiting tractor harvest on poorly drained soils, designated skid trails, and cable yarding. Once compaction damage has been sustained mitigation includes deep subsoil tillage. The effectiveness of subsoil tillage depends upon the typed of implement used, soil properties, soil moisture content and experience of the operator. No data exists to help evaluate the effectiveness of tilling in restoring the productive qualities of compacted soils. Information is needed to quantify the effects of compaction related growth reductions on a managed stand basis.

The effectiveness of measures to mitigate compaction will be tracked using a point transect sampling system. Long term changes in productivity may be tracked through measurements of tree growth taken at ten year intervals.

Erosion. Mitigation techniques beyond the developed Standard and Guidelines include water barring roads, skid trails and log drag corridors, vegetated leave strips adjacent to streams, leaving down woody material and applying a grass/mulch mixture to areas of exposed soil and bare cut and fill slopes of forest roads. The use of cable systems to reduce acreage harvested by tractor can minimize erosion impacts. Broadcast burning can be timed and executed to avoid removing the duff layer.

Establishing ground cover with grass seeding and mulching is an effective means of controlling surface erosion. Water bar are highly effective in diverting surface runoff and reducing erosion. Prescribed spring broadcast burning is an effective measure in reducing duff consumption and exposure of soil on steeper slopes.

Where general seed and mulch applications are not adequate to control erosion, roll down nets or mats can be applied to control erosion. The effectiveness of erosion control measures will be monitored through accomplishment reports for various erosion control projects. The effectiveness effective ground cover rates needs validation on shallow soils.

Sedimentation. Practices to reduce delivery of material to streams include leaving strips of timber and brush along creeks to serve as sediment filters, use of water bars in situations where channelling can occur, minimizing soil exposure and spacing culverts frequently enough to prevent water in roadside ditches from travelling long distances. The idea is to place a culvert on either side of a stream culvert to minimize the amount of water that would flow directly from ditch to stream. A variety of retaining structures can be used to channel water flow and prevent soil movement. Roads that have served their purpose can be ripped and seeded, "put to bed," so that the area can once again support vegetation. The surface of heavily used roads or roads in sensitive areas can be stabilized by paving or addition of rock aggregate to reduce sediment production.

Broadcast burning when duff moisture is high is very effective in reducing erosion impacts. Closely spaced culverts are a very effective mitigation tool for preventing delivery of soil to streams. Water bars are very effective in diverting overland flow.

Long Term Productivity. Effects of removal of woody material on long term productivity are mitigated by leaving six down logs of 40 cubic feet in volume and six standing trees for future woody input. Effectiveness of this mitigation is not known because the amount of material needed for maintaining long term productivity has not been determined. Mitigation provides for a minimum level of organic material be left as a source of organic carbon to fuel the microbiologic populations important to the nutrient cycling process. The effectiveness of this measure is not known. Levels of large woody material necessary to sustain productivity over time for different ecosystems needs to be determined. Base nutrient concentrations need to determined on different Forest soil types to evaluate the impacts of harvest effects on nutrient depletion.

Fertilization. Impacts on water quality can be avoided altogether by applying fertilizers in amounts and on locations which will prevent depositing them into streams. Research has demonstrated applications of nitrogen are highly effective in increasing short term productivity of stands of Douglas-fir. More information is needed regarding the magnitude of response achievable on different Forest soil types.

Air Quality

Introduction

The primary impact on the Forest's air quality comes from particulates produced by wildfires and burning prescribed by various alternatives. The impact of particulates on visual quality is a major concern, especially with respect to Class 1 areas as defined in the Clean Air Act. On the Forest, the Mt. Hood Wilderness and a part of the Mt. Jefferson Wilderness Area are designated Class 1 areas. The section on air quality in Chapter III contains a description of air quality standards.

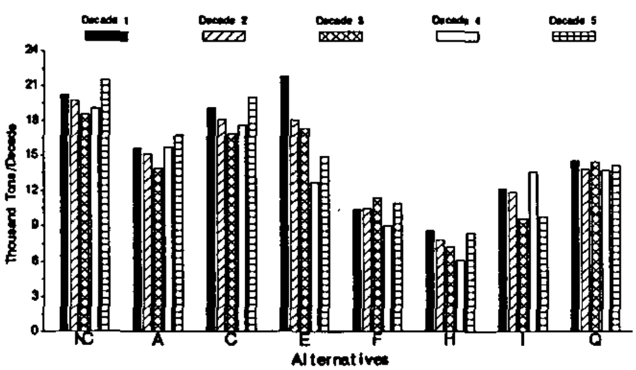
Related ICOs

- Availability of firewood
- Timing of fuel management projects

Direct and Indirect Effects

Alternatives with the highest timber harvests would produce the highest levels of suspended particulates less than 10 microns in size (PM10) from prescribed burning. This is shown in Figure IV-1.

Figure IV-1 Expected Production of Particulates Less Than 10 Microns in Size (PM10)



These projections represent substantial reductions from current quantities of suspended particulates currently produced on the Forest. Using 1976 through 1979 as a base period, current PM 10 particulate production is about 39,100 tons per decade. That tonnage is in itself much reduced from earlier decades because particulate production has dropped as the amount of slash requiring disposal has dropped. Since 1975, the average quantity of slash burned per acre of harvest has declined from 77 to 40 tons. This trend reflects more efficient utilization of wood by wood processors, as well as more woody debris being left on site by managers to fulfill its role in forest ecosystems The decline in amount of slash burned is expected to continue. Table IV-7 shows the acreage where prescribed burning would occur in support of timber management activities.

Suspended particulates, whether from natural or man-made sources, reduce visibility on and off the Forest. Natural sources of particulates include clouds and air with a high moisture content. Man-made sources are mainly particulates from prescribed burning both on and off the Forest. During the summers of 1982-84, the State of Oregon, Department of Environmental Quality (DEQ) and the Forest conducted visibility monitoring at Hickman Butte Lookout for the Mt. Hood Wilderness. Median visual range within the Wilderness averaged 74 miles with a range from 11 miles to 138 miles. The average of impaired visibility from Man-made sources during the period from July to September was 140 hours. Impairment was considered "just perceptible" for 80 hours, "moderate" for 46 hours, and "heavy" for 16 hours. Therefore impairment of visibility from Man-made sources averaged 13% of the daylight hours or 1 1/2 hours per day. Impairrment was moderate or heavy only 6% of the daylight hours representing 45 minutes per day. About 30% of the hours with impaired visibility were affected by dispersed plume impacts while 70% were impaired by regional haze.

Figure IV-2 Percent Decrease in Particulates Less Than 10 Microns in Size (PM10) From the Baseline (1976-79) Levels

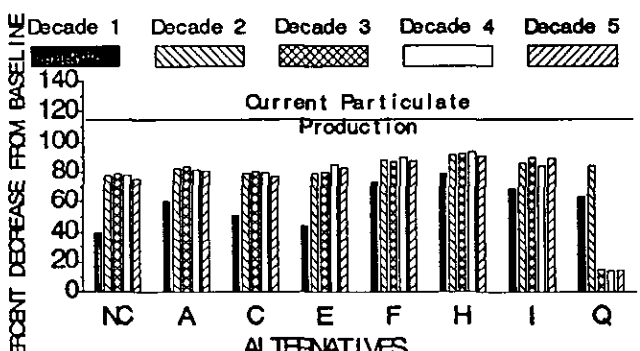


Figure IV-2 shows the projected reductions from current levels of suspended particulates less than 10 microns in size (PM10) issuing from prescribed burning under all alternatives. The table clearly shows that alternatives with low levels of timber harvest produce the greatest reductions in particulates. Alternative Q, for instance, would

Table IV-7 Expected Number of Acres Where Prescribed Fire is Used for Fuel Treatment and Site Preparation
(In Thousands of acres)

Number Per Decade, Decades 1-5	Alternative							
	NC	A	C	E	F	H	I	Q (Preferred)
Decade 1	33.4	25.7	31.4	36.0	17.2	13.3	20.2	24.1
Decade 2	32.4	24.9	29.9	30.2	17.5	12.9	19.9	23.0

reduce PM10 production 63% or more by the turn of the century.

Reductions of particulates projected in Figure IV-2 would be accomplished through improved utilization of wood residues, less burning of woody debris left on the site and burning when production of particulates would be minimal. The impairment to visibility from dispersed plume impacts should also be reduced by these percentages because particulate production correlates directly to visibility impairment. Furthermore, utilization of the Oregon Smoke Management Plan and scheduling prescribed burning when environmental conditions are optimum would reduce plume impacts.

Some indirect effects related to air quality can be expected. The effect of wood smoke on human health is negligible at the concentrations under discussion. Even though negligible, however, the addition of any polluting agent into the atmosphere should be minimized. Reductions in emissions of suspended particulates would noticeably increase the visual quality on the Forest.

Fire is an important tool for the task of vegetation management and site preparation on the Forest (see the Fire Management component in this chapter). Restrictions on the use of fire to minimize the impairment of visibility would affect the Forest's ability to reforest the land. The effects would vary in degree, but they would be most significant in any alternative with an annual timber sell greater than 315 MMBF, i.e. all Alternatives except NC and E (Decade 1 only). At harvest levels above this point the number of days when burning is feasible would be insufficient to accomplish site prepartion. This would result in delayed reforestation of lands requiring site preparation.

Fire is also an important natural component of the Forest's ecosystems, especially on the east side. Excluding fire from these ecosystems in the past has resulted in fuel loading increases. Wildfires in these areas burn more acres at a higher intensity with resultant increases in damage than would have occurred had nature been left to run its normal course.

Cumulative Effects Of the Alternatives On Air Quality

Particulates produced by burning slash on the Forest can combine with emissions from field burning, auto exhaust, and industry to form regional haze. While the problem of regional haze is beyond the scope of this statement, Forest management activities will be modified in recognition of the role of burning slash as a component of regional haze.

A 1985 survey of Portland area residents by the Oregon Department of Environmental Quality (DEQ), Air Quality Division, indicates at 5% of the firewood cut for residential home heating was cut on National Forest land. DEQ's 1988 Annual Report indicates that the 1982-88 annual arithmetic mean for PM10 is approximately 50% of the National Ambient Air Quality Standard for PM10. As the vast majority of firewood available to the public results from timber sale harvest, a change in the availability of firewood can be inferred from the annual allowable sale quantity (ASQ). The following table indicates the expected percent change in firewood availability from Alternative NC.

Except for the first decade in Alternative E, all Alternatives A-Q in the first five decades will produce less firewood than Alternative NC. Hence except for Alternative E in the first decade, the effect of firewood availability on the PM10 arithmetic mean for the Portland metropolitan area should be negligible.

The DEQ 1988 Annual Report does not provide air quality data for any other city than Portland whose residents can reasonability be expected would travel to the Mt. Hood National Forest to gather firewood.

Table IV-8 Percent Change in Firewood Availability from Alternative NC

Percent Change, Decades 1-5	Alternative							
	NC	A	C	E	F	H	I	Q (Preferred)
Decade 1	+00	-25	-9	+2	-51	-66	-47	-39
Decade 2	+00	-30	-9	-22	-49	-65	-47	-38
Decade 3	+00	-24	-10	-29	-51	-67	-48	-39
Decade 4	+00	-25	-11	-28	-51	-66	-50	-39

Mitigation

New technology and techniques have greatly improved the efficiency of prescribed burning operations. At the same time, research continues to confirm the vital role fire plays in forest ecosystems. To continue using fire in managing the Forest, it will be necessary to mitigate undesirable impacts as much as possible.

Perhaps the most effective form of mitigation is the timing of burning operations. Correct timing, such as burning in the spring, can reduce the amount of fuel consumed due to higher fuel moisture. Burning when smoke will ventilate into the upper atmosphere or away from centers of population and Class 1 areas would also reduce impacts. Burning in periods of low visitor use would reduce impacts on Forest visitors especially in Class 1 areas. The method of ignition itself can mitigate impacts. Mass ignition would minimize the transfer of heat downward and reduce the longevity of the smoldering phase of combustion.

Directional felling will reduce breakage with corresponding reductions in fuel loading. Increased utilization of currently substandard material would reduce the presence of smoldering fuels and the need to burn anything at all. Alternatives to burning, like chipping and crushing, will be used wherever practicable.

Volumes of suspended particulates would also be reduced by restrictions on prescribed burning, particularly broadcast burning. The main substitute for broadcast burning would be yarding of unmerchantable material (YUM). Under this technique, logs of a certain size would be dragged to a landing for disposal. Assuming that disposal would be at least partly by non-burning means, this method would substantially cut production of suspended particulates. Yarding techniques have the concurrent effect of encouraging utilization of material previously considered cull. Once hauled to a landing, much more of this material would be utilized than if left in the unit. Demand for this type of material is increasing and should contribute to future reductions in suspended particulate production.

The above mitigation measures are very effective in mitigating air quality impacts as shown in Figure IV-2. Predicted reductions in particulates are based on emission factors, acres treated, and treatment type. Reductions from current levels are a direct result of the mitigation measures described above. Timing of burning operations has already proven very effective in mitigating air quality impacts. Burning under favorable ventilation conditions has significantly reduced impacts, as has spring burning.

Utilization standards have steadily increased over the past decade, with corresponding reductions in tonnage burned, and consequently, reductions is air quality impacts.

Air quality will be monitored to assure compliance with the Oregon Department of Forestry Smoke Management Plan.

Potential Conflicts with Plans and Policies of Other Jurisdictions

Please refer to the end of this chapter for a discussion of the possibility of conflicts between the alternatives and the plans and policies of other jurisdictions with responsibility or authority for this environmental component.

Water

Introduction

This environmental component describes the potential direct, indirect, and cumulative effects of the proposed alternatives on: (1) water quantity and quality of streams, lakes and wetlands; (2) stream channel conditions; and (3) aquifers and groundwater recharge. Also included in this section is a discussion of the significant interactions among hydrologic processes, watershed components, and various proposed management activities.

The National Forest Management Act (NFMA) and the Clean Water Act (CWA) provide the direction for evaluating the direct, indirect, and cumulative effects of proposed alternatives. Other laws and regulations are cited where applicable. Specifically, NFMA requires that:

"... soil, slope, or other watershed conditions will not be irreversibly damaged;"

"... protection is provided for streams, streambanks, shorelines, lakes, wetlands, and other bodies of water from detrimental changes in water temperature or chemical composition, blockages of water courses, or deposits of sediment ... likely to seriously and adversely affect water conditions or fish habitat."

The Clean Water Act declares a policy to "restore and maintain" clean water and directs states to adopt antidegradation policies. The state antidegradation policy and implementation methods must safeguard existing water uses. No degradation is permitted in "Outstanding National Resource Waters" which include designated Wild and Scenic Rivers.

Beneficial uses to be protected are those identified by the State of Oregon (OAR 340.41) and discussed in Chapter III. These include anadromous and resident fish spawning and rearing, private and public domestic water supplies, hatchery intakes, wildlife habitat, boating, aesthetic recreation, hydropower, and several others.

To assist in prescribing standards and management practices, four stream classes are defined according to the beneficial uses which occur:

- Class I streams are those with anadromous fish, significant sports fish, and domestic water intakes;
- Class II streams are perennial or intermittent streams which may be utilized, at least seasonally, by resident fish;
- Class III streams are other perennial streams;
- Class IV streams are intermittent streams which do not meet any of the preceding criteria.

The water quality and stream conditions in Class I and II streams is of primary concern, however the influence of Class III and IV streams is equally important in determining the effects in downstream reaches.

Quantitative measures of water quality needed to provide for many of these beneficial uses has not been determined. Where the State of Oregon has established numerical standards designed to protect beneficial uses (i.e. for turbidity and temperature, etc.), application of Best Management Practices is the primary means of achieving these standards. In the absence of models which can predict the circumstances under which these standards would be met, the differences between the various proposed alternatives are described in terms of risk of not adequately protecting these beneficial uses and potential for causing a certain effect.

In order to assess the effects of the various proposed alternatives on water, it is necessary to analyze and discuss interactions with various watershed components including geology, soil, fish, and vegetation. The reader is encouraged to refer to other sections in this chapter for a more detailed discussion and understanding of effects related to these and other components.

Assumptions used to predict the environmental effects on watershed resources

Assumptions for predicting effects on watershed resources and values include:

- Timber harvest and road construction will increase soil erosion rates and the magnitude and frequency of peak flows, similarly to that observed in the past and reported in the current scientific literature.
- Erosion rates and the occurrence of peak flows are directly related to the amount timber harvest and road construction within a watershed, and the location of such disturbances relative to sensitive watershed lands (riparian areas, unstable lands, etc.).
- Mitigation measures, such as the implementation of Best Management Practices, will reduce erosion rates and the potential for management-induced peak flows, but will not eliminate these effects.
- Stream systems and watershed characteristics are in dynamic equilibrium. Significant changes in erosion rates and instream channel stability upsets the equilibrium, leading to degraded water quality and fish habitat.
- Some watersheds are more sensitive to management disturbances than other watersheds. Watershed sensitivity is a function of various inherent watershed characteristics including soil erosion potential, occurrence of unstable lands (earthflows, etc.), channel characteristics and condition, and the percentage of the watershed area lying within the transient snow zone.

- Alternatives which avoid or reduce the amount of management disturbance within sensitive watersheds (Special Emphasis Watershed or similar "reduced harvest" allocation) will result in less potential for adverse watershed effects.
- Dispersing watershed impact areas (areas disturbed by timber harvest and road construction) over time and avoidance of sensitive lands is effective in minimizing adverse watershed effects.
- Watershed impact areas "recover" hydrologically as a function of vegetative regrowth. The rate of hydrologic recovery varies by location, the type of vegetation, and the degree of initial disturbance.
- The hydrologic recovery model in FORPLAN assumes that complete recovery is achieved when a disturbed area becomes re-established with coniferous vegetation having a 70 percent crown closure and average of eight inches diameter at breast height (dbh). This is only a model. Actual recovery varies by site and is estimated to take between 25 and 35 years.

Significant Interactions

Hydrologic Processes and Watershed Components - The interaction between hydrologic processes and watershed components (including geology, soils, vegetative cover, etc.) is very complex. Resource management activities contribute further complexity. Surface soil erosion, mass-wasting, and channel scour are all processes which occur naturally. However, ground disturbance, removal of soil-anchoring vegetation, and concentration of water caused by management activities tend to accelerate the interactive processes. Increases in water temperature and sediment can reduce the quality of fish habitat. Excessive turbidity can affect the quality of angling in the Forest's streams and rivers, as well as water utility for domestic use.

Water quality, stream channel stability, soil erosion, mass-wasting (landslides), and long-term productivity are the forest components that would most likely be affected by interactions of both management activities and natural conditions. Soil erosion, mass-wasting, and long-term productivity are discussed in more detail in the Soil and Geology Sections of this chapter as well as in Chapter III. Stream temperature and stream sedimentation (and turbidity) are the two water quality parameters most sensitive to management activities. Water temperature is affected primarily by loss of stream canopy cover, while sediment is delivered to streams and other water bodies by surface erosion, channel and bank erosion, and mass wasting.

Water quality and fish habitat, frequently referred to as "riparian-dependent" resources, are strongly affected by management of, and conditions within, adjacent riparian areas (Meehan, et al, 1977; Chamberlin, 1982 and others). These interactions are more fully discussed in the Aquatic Resources (Fisheries, etc.) section of this chapter.

Riparian Areas. Riparian areas, floodplains, and wetlands form the transition between the upslope terrestrial ecosystem and the stream, lake, or wetland ecosystems. Riparian areas provide shade, large woody material, and small organic material to aquatic habitat. Riparian areas are also a particularly diverse part of the terrestrial ecosystem, providing critical plant and wildlife habitat diversity and a substantial portion of the Forest's dispersed recreation. Riparian areas commonly have highly productive timber sites and frequently are the most economic road locations (along floodplains, stream crossings, etc.).

Trees in riparian areas provide input of large woody material to the floodplain, channel, and water. Large woody material is recruited into stream channels as trees are blown over, or the tops are broken out. This material influences the creation and stability of aquatic habitat conditions such as pools, side channels, and well-sorted gravels, and influences the stability of stream channels by armoring streambanks and dissipating the velocity of water.

Practices within or adjacent to riparian areas which have the potential to affect water quality and stream conditions are those which influence shade, streambank stability, the rate of input of large woody material, floodplain characteristics, and wetland characteristics. These are discussed further on.

Annual Water Yield and Runoff Timing. An increase in runoff (water yield) as a result of management activities was not modeled. Research studies indicate that harvest of mature timber generally increases annual water yields in smaller basins. This is due primarily to reduced evapotranspiration (Harr, 1983). The additional water yield results in small increases in summer flows and modest increases in fall peak flows. The magnitude and duration of the increases within smaller watersheds depends on the amount of cutting, vegetation type, soils, geology, and climatic factors. Water yield will decline with time as harvested areas reforest.

Estimated sustained increases in annual water yield from most large watersheds (e.g. the 15 major drainages on the Forest) subject to sustained yield forest management are, at most, three to six percent more than flows from an undisturbed forest. The typical increase in a large watershed drops to approximately one percent when timber harvesting is reduced to meet other resource management objectives. On the Mt. Hood National Forest it is believed that flow increases, if any, have already been realized due to past extensive and intensive timber harvesting practices. Subsequently, there is little or no potential for increasing annual water yields in most large watersheds. Other factors which further minimize the potential to change annual streamflow are high natural variability and the fact that flow measurement accuracy is within five percent at best (so potential changes are less than what is measurable in large watersheds). Moreover, most of the flow increases occur at times of the year when water is needed least or not at all.

Watershed Disturbance and Peak Flows. During the winter, when soils are generally saturated, the magnitude of larger peak flows will normally be similar with or without timber harvest and roads (Wright 1985). However, increased peak flows have been documented in larger drainage basins within the "transient" snow zones of the Western Cascades. On the Mt. Hood Forest, the transient snow zone generally occurs between 1,000 and 5,000 feet in elevation. Harvest areas and roads within the transient snow zone appear to contribute to increased peaks flows associated with the less frequent "rain-on-snow" events (Christner and Harr, 1982).

Soil disturbance (associated with roads, landings, skid trails, and harvest site preparation, etc.) causes hydrologic changes affecting the timing, volume, and quality of runoff. Infiltration and percolation through the soil mantle may be reduced due to compaction and "puddling" of the ground surface or as a result of hydrophobic soil conditions associated with intense burning. As runoff volume increases, the duration of runoff often decreases. Increases in the volume of runoff delivered directly to the stream system increases the potential for damaging peak flows and subsequent stream channel scour and degradation. Reduced infiltration and percolation rates associated with soil disturbance, particularly in or adjacent to riparian areas, and the decreased "residence time" of water within the stream system may reduce the rate or quantity of groundwater recharge and the amount and duration of summer base flows. Refer to the Soils Component in this chapter for additional information on soils related environmental effects.

Water Quality (Turbidity, Temperature, etc.). In general, activities which have the potential to increase water yield, particularly as peak flows, also tend to increase the potential for sedimentation. As described previously, the primary sources of sediment are natural and management-related surface erosion, channel erosion, and mass wasting. An increase in the amount of delivered sediment to streams can affect the clarity or turbidity of the water. Turbidity (cloudiness) is a measure of the capacity a given volume of water to transmit light. When sediment rates increase, turbidity will increase. The amount of turbidity produced per unit of suspended sediment concentration depends on the size, shape, and color of the sediment particles. While a strong relationship between sediment and turbidity can be developed within a watershed, this relationship can vary significantly between drainages (Beschta, 1980). Turbidity usually drops off rapidly after the triggering storm events; however, reservoirs and lakes may experience increased turbidity for an extended period of time. Earthflows are often major contributors to turbidity because of high clay contents and active erosion in the toe positions of the failure.

Water temperature can be affected by removing the vegetation that shades streams, or by summer water withdrawals for irrigation, domestic consumption, or other uses. For many streams, as discussed in Chapter III, summer water temperatures are at critical levels for the survival of cold water game fish. This condition exists due to both natural and activity-induced impacts. Natural conditions can range from very low summer stream flows, to a geology-related lack of stream shading. A combination of streamside conditions resulting from past activity and the activity of adjacent landowners may combine to create a potential impact on instream uses.

Aquifers and Groundwater Recharge. The interactions of management activities on groundwater recharge and the functioning of aquifers are similar to the interactions described for streamflow (water yield, runoff timing, peak flows, etc.), except for timing differences. Aquifer responses to activities are typically slower and fluctuate less than surface streamflow. Timber harvesting on a sustained yield basis, as proposed under any of the alternatives, is expected to have a negligible effect on aquifers. There is no realistic potential to modify timber harvesting to augment downstream water supplies. Conversely, it is unlikely that management activities associated with the proposed alternatives would decrease the amount of water available for downstream aquifers, assuming that management practices are conducted in a manner which reasonably maintains water infiltration characteristics, as is typical of current practices on

National Forest lands. Activities causing extensive, contiguous areas of soil compaction or substantial disturbance of riparian areas could result in reduced infiltration sufficient to affect downstream aquifers. Application of Best Management Practices provides a means by which adequate infiltration characteristics can be maintained.

Interactions - Cumulative. Cumulative effects are the result of individual direct and indirect effects within a defined area and intended period of time. Cumulative effects may be more or less than the sum of individual effects. Current scientific literature and the collective knowledge of Mt. Hood National Forest resource specialists supports the concept that a major portion of cumulative watershed effects are directly related to the amount of watershed disturbance associated with timber harvesting and road construction activities. The inherent sensitivity of individual watersheds is a determining factor in assessing the amount of watershed impact which can be absorbed before cumulative effects are realized.

The Forest has developed and applied a methodology for assessing the inherent sensitivity of various watersheds and the amount of "watershed impact area" associated with each proposed alternative. This methodology is described briefly in Appendix A more detailed discussion of the methodology is included in the process paper *for Assessing Watershed Sensitivity and Cumulative Effects*. In general, alternatives which propose greater amounts of timber harvest and related road construction would have the greatest potential for increasing peak stream flows and sediment production. These alternatives would also pose the greatest risk of cumulative impacts to various water- and riparian-dependent resources.

Management Activity Interactions

Significant interactions with the water and riparian resources are possible from any management activity that disturbs the soil, reduces root strength on steep slopes, reduces organic matter, disrupts watershed drainage, or reduces riparian vegetation. Road construction, timber harvest, fuels treatment, and the development of energy resources or mineral deposits are the principal resource management activities with potential for significant interactions with the water and riparian-dependent resource.

Timber Management. Timber management activities, including timber harvest, slash treatment, site preparation, affect the water resource in varying degrees through the alteration or destruction of vegetation, the compaction or disturbance of mineral soil, and changes in sediment yield and temperature (Fredriksen and Harr 1979; Hewlett and Doss 1984).

Consequences can include reduced infiltration rates and capacity, water channelization, overland water flow, and increased susceptibility of the soil to detachment and displacement due to the impact of raindrops. Ground disturbance is the first step in a process that eventually leads to soil movement and reduction of water quality from sedimentation (see Soils section in this Chapter). The potential for impact becomes greater on steeper slopes and more erodible soils.

Removal of streamside vegetation has a direct effect on water temperature with potential for increased temperatures during summer months (Brown and Krygier 1967), and for lower temperatures in winter. Increased ice formation can result in stream bank damage (Chamberlin 1982; Swanson 1980). Increased water temperatures also reduce the amount of oxygen that can be dissolved in water. At higher temperatures more rapid decompostion of organic debris (needles, leaves, branches) in streams may reduce dissolved oxygen below critical levels for fish (Berry 1975). Higher stream temperatures in conjunction with increased availability of nutrients and sunlight may contribute to the formation of nuisance blooms of algae.

Removal of large woody material, or the sources of future material, through timber harvesting activities may lead to the eventual widening of channels on low gradient (generally Class I and II) streams. This, in turn, may result in the loss of productive land area, filling of pools, and shallower, more exposed aquatic habitat. On steeper gradient Class III and IV streams, instream wood controls the movement of sediment through the system by trapping silts, sands, gravels, and cobbles. Loss of instream wood and the source of future recruitment may accelerate the release of theses sediments to downstream Class I and II streams. Moreover, removal of instream wood and its stabilizing role may increase the frequency and extent of debris torrents originating in these upper headwater streams.

Transportation System. While road effects are often difficult to separate from timber harvest effects, it is generally agreed that roads account for the majority of severe sediment problems and are often the conduits between sediment source areas (skid trails, landings, cut/fill slopes) and stream channels. The magnitude of the impact is determined by such factors as season and amount of use, soil characteristics, terrain, vegetation, and the likelihood of sediment from source areas reaching a watercourse. Roads constructed adjacent to (parallel to) streams deliver up to twice the amount of sediment as that from mid-slope or ridge top roads (Anderson 1974; Wooldridge 1980). Roads parallel to streams may reduce shade on some sites by as much as 43 percent (Thomas 1979, Skeesick and Steward 1981).

In addition to road location, construction methods and design elements may directly influence water quality and channel stability. Uncompacted fills and sidecast construction techniques, where excess soil material is pushed over the side, are primary sources of sediment and a cause of debris slides and debris torrents (Swanson and Grant 1982). Roads and fills constructed with uncompacted soil material become saturated and fail more readily than roads constructed with compacted fills. Low standard or temporary roads remaining open after the period of intended use may become chronic sources or erosion and sediment. Maintenance operations (clearing ditches, reshaping cutslopes, grading of road surfaces, etc.) can prolong recovery and significantly increase erosion and sedimentation (Bullard 1963)

Off Road Vehicles. The operation of off road vehicles (ORVs) can affect water quality through the destruction of vegetation and compacting and rutting road surfaces. The magnitude of the impact is determined by such factors as season and amount of use, soil characteristics, terrain, vegetation, and the proximity to a watercourse.

Recreation. Intensive recreation can affect water quality primarily through the destruction of vegetation and compacting the soil. This results in reduced infiltration and channelization of water, subsequent accelerated erosion, and entry of sediment into watercourses. Roads and trails providing access for recreational use may have associated impacts as discussed previously.

Summer homes, recreation resorts, and ski areas all have the potential to impact water quality. In addition to vegetation alteration and soil disturbance, other potential impacts may include septic system malfunctions, spills or inappropriate disposal of hazardous materials, etc. Many recreational activities, resorts, and recreational residences are located adjacent to streams and lakes, increasing the risk of adversely affecting water quality. Salt has been used to preserve snow at ski resorts but, to date, follow-up monitoring has not detected detrimental effects to watercourses, soil, or groundwater.

Livestock Grazing. Vegetation removal and soil compaction (especially of moist riparian soils) by grazing animals can reduce infiltration and increase the potential for overland flow and soil erosion. This can affect changes in sedimentation, peak flows, and channel morphology (Anderson et al 1976; Blackburn 1983; Gebheardt and Johnson 1981; Platts 1981). Grazing is reported to be 25 to 60 percent heavier on streambanks in riparian areas than on adjoining uplands (Nelson and Platts 1985). This concentration can lead to significant soil disturbance and compaction within the riparian areas.

Removal of streamside vegetation through excessive browsing has a direct effect on stream temperature, especially on sites where shade trees are insufficient or lacking or where grasses and shrubs provide a large proportion of the effective shade.

Heavy grazing of riparian areas and the resultant loss of vegetative cover can lead to bank sloughing and collapse. Such streambank degradation leads to increased sediment loading, pool filling, and wider, shallower channels. Impacts to the chemical quality of water are quite variable and difficult to monitor, but increases in organic matter and bacteria occur as a result of grazing (Francis and Schepers 1982; Skinner et al 1974).

Mining Activities. Mining activities can affect water quality by exposing spoils piles and tailings to erosion, increasing the potential for sedimentation. Chemicals can leach into streamcourses from spoil piles or treatment processes. Mineral and geothermal exploration and development may have potential impacts related to vegetation removal, road construction, and possible disruption of aquifers or mixing of groundwater. The full extent of such potential impacts is not fully understood and is difficult to assess.

Management Area Allocations

Land allocations have a direct bearing on water and dependent resources. The "A" allocations, for instance, have no programmed harvest. In general, a higher percentage of the forest land base allocated to these Management Areas results in less impact on water and related resources. By contrast, the "C" Management Areas allow for more development, principally through timber harvest and road construction. A higher percentage of the land base allocated to these Management Areas entails a greater degree of risk to water and dependent resources. The "B" Management Areas allow for reduced levels of harvest and associated roading. Guidelines for management of these areas often provide for smaller unit size and/or tend to disperse impacts over time and space which, in effect, substantially reduces the risk to water and riparian-dependent resources.

Management Areas A9, B1, B6, B7, and B8 are especially important in the protection and enhancement of water-dependent resources. Management Areas A9, DA9, and EA9 (Key Site Riparian) recognizes riparian areas noted for exceptional aquatic and terrestrial habitat diversity and high quality water. Tree removal and other development activities are very limited. Management Area B1 (Wild, Scenic, and Recreational River) recognizes and maintains the unique values associated with these rivers. Management Area B6 (Special Emphasis Watershed) emphasizes the maintenance and improvement of watershed, riparian, and aquatic habitat conditions for watersheds having a combination of high water-dependent resource values and high inherent sensitivity. Management Area B7, DB7, and EB7 (General Riparian) restricts or limits activities, particularly related to ground disturbance and vegetation removal, adjacent to all streams, rivers, lakes, wetlands, etc. Management Area B8 (Earthflow) generally restricts activities where the risk of mass slope instability is high.

Figure IV-3 Acres Managed to Meet Riparian and Water Objectives

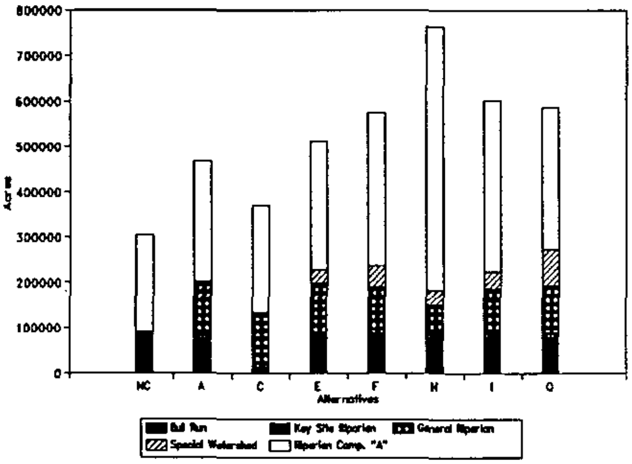


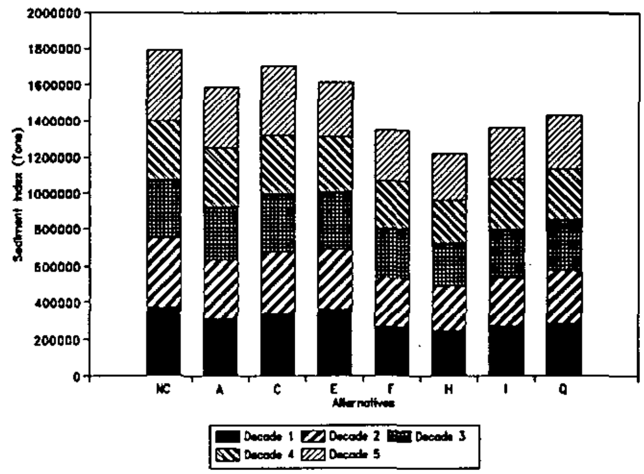
Figure IV-3 displays the total acres of various management areas specifically managed to meet water and riparian objectives. The figure displays the relative proportions of A9, DA9, EA9, B6, and B7, DB7, and EB7 allocations. Also included are acreage figures for the Bull Run (D) and various riparian-compatible "A" allocations, such as Wilderness and Unroaded Recreation, etc. Acreages for Wild and Scenic Rivers (B1) and Earthflows (B8) are not included.

In other designated Management Areas, activities having the potential to affect water and riparian resources are governed by appropriate Standards and Guidelines (Forest Plan, Chapter 4) and associated Best Management Practices (FEIS, Appendix H).

Related ICOs

- Maintenance and rehabilitation of fish habitat and water quality.
- Maintenance of high quality water from forest lands for domestic water supplies.
- Maintenance of minimum flows and hydrologic balance.

Figure IV-4 Sediment Index by Alternative Cumulative Decade Total, by Alternative



Environmental Effects by Alternative

Several figures are included to help illustrate and interpret potential effects, whereas others illustrate effects by major drainage for each alternative. Figure IV-4 displays the cumulative forest-wide sediment index values by decade for each alternative. Figure IV-5 displays the cumulative increases in sediment index values over background levels for the five-decade planning period. Figure IV-6 graphically displays the percent change in sediment index values for each alternative relative to the current management situation (Alternative A). Figures IV-7a to IV-7g display the amount of "watershed impact area" (see glossary) by major drainage for each proposed alternative. Finally, Figure IV-8a to IV-8o illustrates sediment index values for each major drainage, by decade, for each proposed alternative. Note that the scale varies by drainage in order to more clearly display the differences between alternatives for each major drainage.

Alternative NC

Direct and Indirect Effects

Alternative NC does not incorporate any of the recent land suitability classifications nor does it implement any of the current management direction. There are no provisions for riparian area management other than the exclusion of approximately 5,000 acres of unstable slopes adjacent to streams. In addition, the Bull Run watershed is managed to maintain riparian resources in order to meet the goal of providing high quality water to the City of Portland. Refer to Figure IV-3, displaying acres managed to meet water and riparian objectives.

Management activities under this alternative will call for constructing approximately 679 miles of new roads during the five-decade planning period. Over 400 miles will be constructed within the first two decades, with the remaining mileage distributed over the last three decades.

Timber harvest activities within currently unroaded areas will comprise approximately 330 acres. This is a relatively low figure, reflecting the fact that much of the currently unroaded areas will remain undeveloped over the planning period.

Figure IV-5 Sediment Index by Alternative Total After 5 Decades

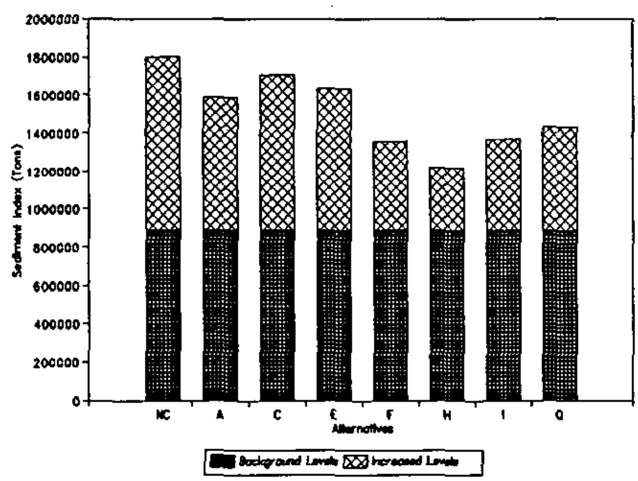
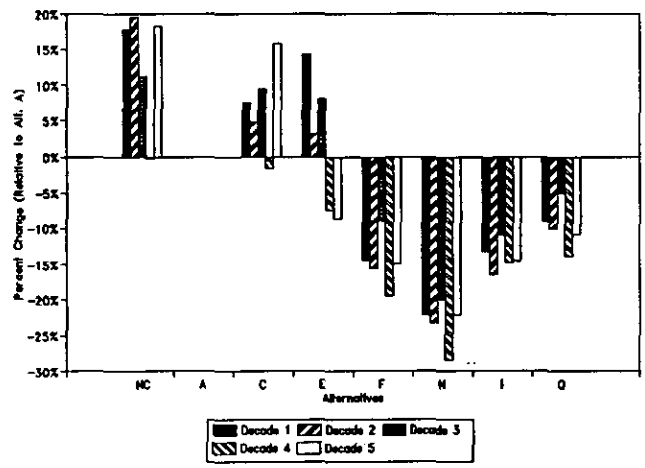


Figure IV-7a, graphically illustrates the "watershed impact area" associated with the combined activities of timber harvest and road construction for each major drainage, by decade. Seven of the fifteen major drainages (including the Collawash, Fish Creek-Memaloose, Hot Springs Fork, Lower Clackamas, Sandy River, Upper Clackamas, and West Fork Hood River) will be substantially impacted by proposed activities, with watershed impact areas at or above the thirty-five percent level. The potential for environmental impacts effects will be greatest in the most unstable drainages, i.e. Fish Creek, Hot Springs Fork, and the Collawash River. Impacts within these drainages will likely include an increased incidence of mass wasting (earthflow movements), destabilizing peak flows, increased

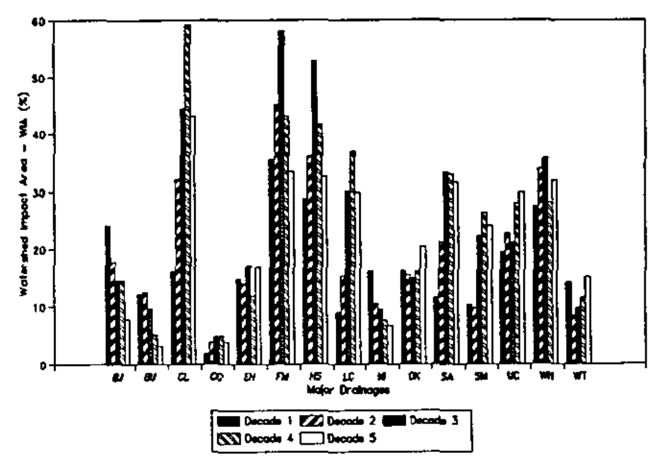
Figure-IV-6 Change in Sediment Index by Alternative Change Relative to Current Conditions



sediment loading, and higher stream temperatures. In contrast, sediment index values for the Bull Run drainage and Columbia Gorge tributaries will remain relatively low, indicating a low likelihood of impact.

Forest-wide sediment index values will increase by 11 percent to 20 percent by decade over current levels, averaging 13 percent for the five-decade period, as illustrated by Figure IV-6. Figures IV-8a to IV-8o, display and compare the sediment index values for each drainage, by decade.

Figure IV-7a Watershed Impact Area by Drainage Alternative NC



With the exception of the Bull Run watershed, management activities implemented under this alternative will not adequately mitigate the impacts of activities on water and riparian-dependent resources. Implementation of this alternative will not meet current direction in maintenance of riparian areas, will not fully meet water quality standards in every case, and will not provide necessary large woody material for maintenance of stream stability and aquatic habitat.

Potential adverse effects on water and riparian resources will be greatest for Alternative NC as compared to any of the other alternatives. The effects on the environment will include a substantial increase in stream turbidity above both current and natural levels (as represented by the sediment index values), especially in areas of concentrated harvest. Other effects include a high potential for degradation of fish habitat, a high risk of increasing stream temperatures due to timber harvesting in riparian areas, and an increased risk of additional loss of riparian vegetation due to blowdown, channel scour, and accelerated bank erosion, related to management activities.

Cumulative Effects

Alternative NC has the greatest potential for creating cumulative watershed effects. None of the improved land classifications, allocations, or management techniques are provided in this alternative. Streamside riparian areas are available for intensive timber management, with the exception of 5,000 acres of unstable lands adjacent to streams. No provision is made for retaining large woody material for channel stability. Moreover, the modeling assumptions do not include any provisions for dispersing activities over time and space as a means of reducing the potential for cumulative effects. As a result many of the drainages will have watershed impact areas far exceeding the thirty-five percent level, at which cumulative effects will be probable. Moreover, many of the drainages will remain "at risk" for several decades, greatly increasing the potential for cumulative watershed impacts.

Alternative A

Direct and Indirect Effects

Alternative A is representative of current conditions insofar that it incorporates all of the suitability analyses and current management direction, providing for minimal management emphasis on riparian areas and dependent resources. Out of a total of 129,850 acres allocated explicitly for riparian area management, approximately 11,700 acres are allocated as Key Site Riparian (A9, DA9, EA9) areas, with the remaining 118,150 acres allocated to General Riparian (B7,BD7, EB7) management. Approximately 269,550 acres are allocated to various "riparian- compatible" allocations such as Wilderness and Unroaded Recreation. In addition, the Bull Run watershed is managed to maintain riparian resources in order to meet the goal of providing high quality water to the City of Portland. Refer to Figure IV-3, depicting acres managed to meet water and riparian objectives.

Management activities under this alternative will call for constructing approximately 595 miles of new roads during the five-decade planning period. Over 380 miles will be constructed within the first two decades, with the remaining mileage distributed over the last three decades.

Timber harvest activities within currently unroaded areas will comprise approximately 19,100 acres. This is a relatively high figure, second only to Alternative C. The activity will be distributed over five decades, with a substantial portion occuring within the first two and last two decades. More importantly, much of the proposed development will occur within the Collawash, Hot Springs Fork, Lower Clackamas, Sandy River, Salmon River, and White River drainages which already exhibit evidence of accelerated sediment production due to a combination of natural characteristics and past management activities outside of the unroaded areas.

Figure IV-7b Watershed Impact Area by Drainage Alternative A

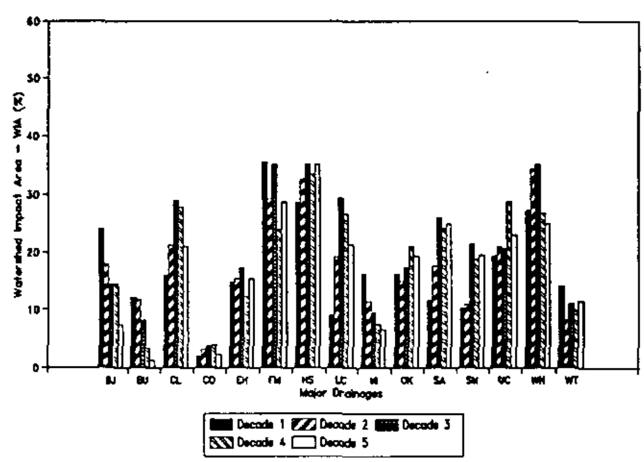


Figure IV-7b graphically illustrates the "watershed impact area" associated with the combined activities of timber harvest and road construction for each major drainage, by decade. Seven of the fifteen major drainages (including the Collawash, Fish Creek-

Memaloose, Hot Springs Fork, Lower Clackamas, Sandy River, Upper Clackamas, and West Fork Hood River) will be substantially impacted by proposed activities, with watershed impact areas at or near the thirty-five percent level.

Forest-wide sediment index values will remain substantially above estimated background levels, as illustrated by Figure IV-6. Figures IV-8a to IV-8o display and compare the sediment index values for each drainage, by decade.

While this alternative includes provisions (standards and guidelines) for the protection of riparian areas, the higher harvest levels and increased road construction associated with this alternative will likely result in a continued decline in water quality and stream conditions necessitating a mitigation program of stream habitat and watershed rehabilitation. The effects on the environment will be an increase in stream turbidity above natural levels (estimated to remain similar to current levels), maintenance of, or slight decline in existing fish habitat, some risk of increasing stream temperatures due to harvest activity in riparian areas, and an increased risk of removing some riparian vegetation due to activity-induced blowdown, channel scouring, and accelerated bank erosion.

Cumulative Effects

Alternative A has somewhat less potential to cause adverse cumulative watershed effects, compared to Alternative NC and Alternative C. However, it has a substantially greater associated risk than any of the other alternatives. Land within the Forest has been classified for suitability for timber management. Land that is unsuitable is allocated to other uses. While management direction applicable to streams and other riparian areas is designed to meet water quality standards, there is an increased risk for accelerated sedimentation and increased stream temperatures. While a watershed impact area "dispersion constraint" of thirty-five percent is modeled for this alternative, many of the major watersheds remain at this critical level for several decades during the planning period. This prolonged period where drainages are "at risk" greatly increases the potential for adverse cumulative effects. Finally, this alternative proposes to enter large portions of currently unroaded areas. Many of these areas are inherently unstable, greatly increasing the risk of watershed impacts associated with road building and timber harvesting.

Alternative C

Direct and Indirect Effects

Alternative C reflects a Forest-wide timber management emphasis, including lands within the Bull Run watershed. Out of a total of 134,250 acres allocated explicitly for riparian area management, approximately 12,600 acres are allocated as Key Site Riparian (A9, DA9, EA9) areas, with the remaining 121,650 acres allocated to General Riparian (B7, DB7, EB7) management. Approximately 240,000 acres are allocated to "riparian-compatible" allocations such as Wilderness and Unroaded Recreation. This alternative is the only one that calls for intensive timber management in the Bull Run drainage. Refer to Figure IV-3, displaying acres managed to meet water and riparian objectives.

Management activities under this alternative will call for constructing approximately 705 miles of new roads during the five-decade planning period. Over 480 miles will be constructed within the first two decades, with the remaining mileage distributed over the last three decades.

Timber harvest activities within currently unroaded areas will comprise approximately 27,300 acres. This alternative includes more timber harvesting, road construction, and related activities within currently unroaded areas than any of the other alternatives. Activities will be distributed throughout the five-decade planning period.

Figure IV-7c Watershed Impact Area by Drainage Alternative C

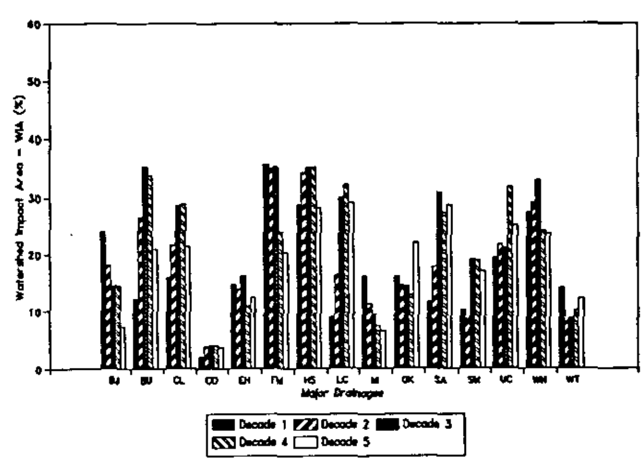


Figure IV-7c graphically illustrates the "watershed impact area" associated with the combined activities of timber harvest and road construction for each major drainage, by decade. Seven of the fifteen major drainages (including the Bull Run, Collawash, Fish Creek-Memaloose, Hot Springs Fork, Lower Clackamas, Sandy River, Upper Clackamas, and West Fork Hood River) will be substantially impacted by proposed activities, with watershed impact areas at or near the thirty-five percent level. A watershed impact dispersion limit of 35 percent prevents FORPLAN from scheduling more harvest in these areas. However, the consistently high levels at which these drainages are held for periods of several decades greatly increases the risk of watershed impacts within these drainages.

Forest-wide sediment index values will increase by five percent to 16 percent by decade over current levels, averaging seven percent for the five-decade period, as illustrated by Figure IV-6. Figures IV-8a to IV-8o display and compare the sediment index values for each drainage, by decade.

Potential effects on water and riparian resources will be greater than for any other alternative except NC. The effects on the environment will include an increase in stream turbidity (both duration and extent) above current levels as represented by the sediment index values, a higher potential for degradation of fish habitat, a higher risk of increasing stream temperatures (due to a high harvest level adjacent to riparian areas), and a higher risk of removing riparian vegetation due to activity-related blowdown, channel scouring, and accelerated bank erosion.

The Forest's primary objective for the Bull Run watershed is to maintain its exceptionally high quality water. Water quality is currently maintained by compliance with the Water Quality Standards for the Bull Run Watershed Management Unit, in accordance with Public Law 95-200, The Bull Run Unit Plan, and ongoing monitoring agreements with the City of Portland. Under Alternative C, the risk of violating current water quality standards will increase substantially and dramatically. This alternative will require substantial levels of increased mitigation above what is currently prescribed, possibly including the need to filter water prior to distribution.

Cumulative Effects

Alternative C has a potential for cumulative watershed effects second only to Alternative NC. While incorporating improved land classifications and management techniques common to Alternative A, this alternative proposes major amounts of timber harvesting and road construction, particularly within currently unroaded areas. Many of these areas are inherently unstable, greatly increasing the risk of watershed impacts associated with road building and timber harvesting. While a watershed impact area "dispersion constraint" of thirty-five is modeled for this alternative, many of the major watersheds remain at this critical level for several decades during the planning period. This prolonged period where drainages are "at risk" greatly increases the potential for adverse cumulative effects.

With the inclusion of the entire Bull Run Management Unit as part of the Forest's programmed timber harvest, there is an increased risk of significant watershed effects, both direct and cumulative, as a result of the intensive timber harvest and associated road construction which will occur during the first three decades. While various practices will be employed to meet established water quality standards and to mitigate possible adverse effects, the magnitude of proposed activity will greatly increase the potential and risk for cumulative watershed effects.

Alternative E

Direct and Indirect Effects

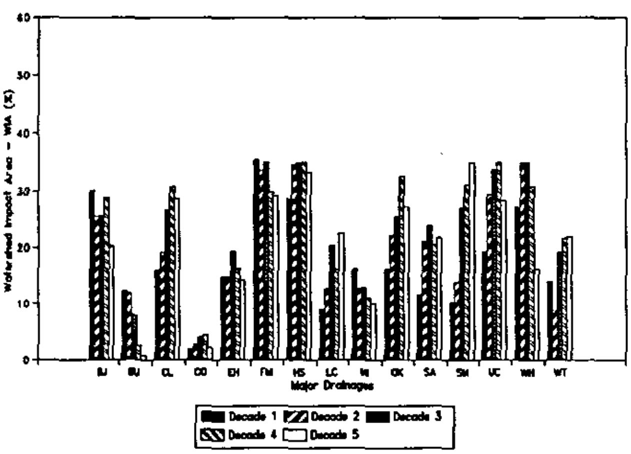
Alternative E is similar to Alternative A in both management emphasis and environmental effects related to water and riparian resources. The main difference is that potential adverse impacts associated with this alternative will be concentrated in the first three decades. Out of a total of 126,800 acres allocated explicitly for riparian area management, approximately 16,100 acres are allocated as Key Site Riparian (A9, DA9, EA9) areas, with the remaining 110,700 acres allocated to General Riparian (B7, DB7, EB7) management. An additional 30,200 acres are included in the Special Emphasis Watershed (B6) management area allocation. Approximately 286,200 acres are allocated to "riparian-compatible" allocations such as Wilderness and Unroaded Recreation. The Bull Run watershed is managed to maintain riparian resources in order to meet the goal of providing high quality water to the City of Portland. Refer to Figure IV-3, depicting acres managed to meet water and riparian objectives.

Management activities under this alternative will call for constructing approximately 610 miles of new roads during the five-decade planning period. Over 450 miles will be constructed within the first two decades, with the remaining mileage distributed over the last three decades.

Timber harvest activities within currently unroaded areas will comprise approximately 6,595 acres. While not as extensive as activities proposed in Alternatives A and C, this increased activity in currently unroaded areas is largely responsible for the relatively high sediment index values predicted for several drainages.

Figure IV-7d, graphically illustrates the "watershed impact area" associated with the combined activities of timber harvest and road construction for each major drainage, by decade. Five of the fifteen major drainages (including Fish Creek-Memaloose, Hot Springs Fork, Salmon River, Upper Clackamas River, and West Fork Hood River) will be at increased risk from proposed activities, with watershed impact areas at or near the thirty-five percent level for much of the five-decade planning period. In contrast to Alternatives NC, A, and C, the Badger-Jordan and White River drainages will experience an increase in watershed impact areas during the planning period under this alternative, sufficient to increase the potential for environmental effects within the watersheds.

Figure IV-7d Watershed Impact by Drainage Alternative E



Forest-wide sediment index values will increase by as much as 14 percent for the first decade, relative to current levels. However, a decline of nine percent will be evident by the end of the fifth decade. For the five decade period, values will average around two percent over levels predicted for current management direction, as illustrated by Figure IV-6. Figures IV-8a to IV-8o display and compare the sediment index values for each drainage, by decade.

There will be an overall slight increase in sediment index values over five decades, as compared to the current situation (represented by Alternative A). Sediment index values will begin to decline, relative to current levels, in the third and fourth decades. The overall effects on the environment will be an initial increase in stream turbidity due to increased harvest levels and road construction in the first three decades. During this period, there will be an increased potential for degradation of fish habitat, a moderate risk of increasing stream temperatures (due to increased harvest adjacent to riparian areas), and an increased risk of removing riparian vegetation due to increased blowdown, accelerated channel scour, and accelerated bank erosion. While the potential effects will be higher, overall, than those predicted for alternative A, the trend will be for improving conditions in the fourth and fifth decades.

Cumulative Effects

Alternative E has a potential for adverse cumulative watershed effects only slightly greater than Alternative A and less than Alternative C. While incorporating improved land classifications and management techniques common to Alternative A, and allocating more lands to riparian or riparian-compatible management areas, this alternative proposes substantial levels of timber harvesting and road construction, particularly within the first two decades of the planning period. Far fewer acres of currently unroaded areas are proposed for entry, in contrast to Alternatives A and C. However, several of the areas are inherently unstable, greatly increasing the risk of watershed impacts associated with road building and timber harvesting. While a watershed impact area "dispersion constraint" of thirty-five is modeled for this alternative, many of the major watersheds remain at this critical level for several decades during the planning period. This prolonged period where drainages are "at risk" greatly increases the potential for significant cumulative effects, though not as great a potential as for Alternatives NC, A, and C. Moreover, sediment index values and watershed impact percentages show a trend towards improvement in the last two decades.

Alternative F

Direct and Indirect Effects

Out of a total of 118,750 acres allocated explicitly for riparian area management, approximately 16,100 acres are allocated as Key Site Riparian (A9,DA9, EA9) areas, with the remaining 102,450 acres allocated to General Riparian (B7) management. An additional 46,150 acres are included in the Special Emphasis Watershed (B6, DB7, EB7) management area allocation. Also included in this alternative are a total of approximately 338,400 acres of "riparian-compatible" allocations, including Wilderness and Unroaded Recreation. The Bull Run watershed is managed to maintain riparian resources in order to meet the goal of providing high quality water to the City of Portland. Refer to Figure IV-3, depicting acres managed to meet water and riparian objectives.

Management activities under this alternative will call for constructing approximately 400 miles of new roads during the five-decade planning period. Approximately 200 miles will be constructed within the first two decades, with the remaining mileage distributed over the last three decades.

Timber harvest activities within currently unroaded areas will comprise approximately 3,480 acres. This is a relatively low figure, reflecting the alternative's emphasis on responding to issues involving scenic and recreational values.

Figure IV-7e Watershed Impact Area by Drainage Alternative F

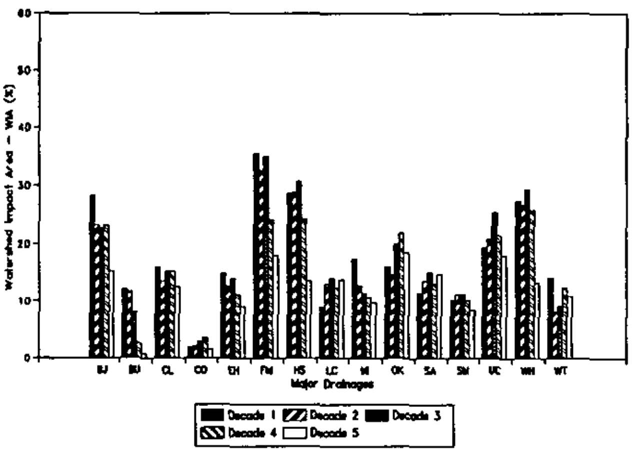


Figure IV-7e, graphically illustrates the "watershed impact area" associated with the combined activities of timber harvest and road construction for each major drainage, by decade. All but two of the fifteen major drainages will have watershed impact areas below the thirty percent level. Only two drainages, Fish Creek-Memaloose and Hot Springs Fork, will be at increased risk of watershed impacts related to the extent of management activities. Overall risk will be substantially lower than that predicted for the previously described alternatives.

Forest-wide sediment index values will decrease by nine percent to 19 percent from current levels, averaging a 15 percent decrease for the five-decade period, as illustrated by Figure IV-6. Figures IV-8a to IV-8o display and compare the sediment index values for each drainage, by decade. Alternative F will have the third lowest overall sediment index values.

The effects on the environment will include a decrease in stream turbidity (as represented by the substantial decreases in sediment index values), a low potential for degradation of fish habitat or increase in stream temperatures, and a low risk of removing riparian vegetation due to activity-induced blowdown, channel scouring, and accelerated bank erosion. Increased recreation use levels, particularly within or adjacent to riparian areas, will have the potential for creating localized, site-specific water quality impacts. Overall, Alternative F will exhibit a general improvement in riparian conditions, water quality, and stream channel stability.

Cumulative Effects

This alternative poses much less of a risk of cumulative watershed impacts than Alternatives NC, A, C, or E, and only slightly more risk than Alternatives H and I. A much greater portion of the riparian lands is allocated to the Key Site Riparian Management Area, having no programmed timber harvest. The balance of riparian lands, while allowing timber harvest, will have substantially less potential for impacts, because of the overall reduced intensity of timber harvest and road construction activities, associated with this alternative. Moreover, a large portion of riparian lands are afforded even greater protection by being allocated to one of the various riparian-compatible management areas. Although land allocated to full yield (C1) or reduced yield (B lands) will still be intensively managed, overall potential for significant cumulative effects will be slight. Increased recreation use patterns within and adjacent to riparian areas may possibly create site-specific impacts, which if not mitigated, may cause the risk of adverse cumulative effects related to water quality and riparian condition to increase.

Alternative H

Direct and Indirect Effects

Out of a total of 80,800 acres allocated explicitly for riparian area management, approximately 16,000 acres are allocated as Key Site Riparian (A9, DA9, EA9) areas, with the remaining 64,800 acres allocated to General Riparian (B7, DB7, EB7) management. An additional 30,100 acres are included in the Special Emphasis Watershed (B6) management area allocation. The Bull Run watershed is managed to maintain riparian resources in order to meet the goal of providing high quality water to the City of Portland. Fewer acres are allocated explicitly for riparian area and watershed management than any other alternative except Alternative NC. Particularly noteworthy, however, is the large amount of "riparian-compatible" allocations, such as

Wilderness and Unroaded Recreation, totalling almost 583,500 acres. Much of the apparent reduction in riparian allocations is actually accounted for in these allocations. Refer to Figure IV-3, depicting acres managed to meet water and riparian objectives.

Management activities under this alternative will call for constructing approximately 329 miles of new roads during the five-decade planning period. Over 149 miles will be constructed within the first two decades, with the remaining mileage distributed over the last three decades.

Timber harvest activities within currently unroaded areas will comprise approximately 2,116 acres. This is the lowest of any of the alternatives except Alternative NC, and reflects this alternative's emphasis on maintenance of old growth characteristics.

Figure IV-7f Watershed Impact Area by Drainage Alternative H

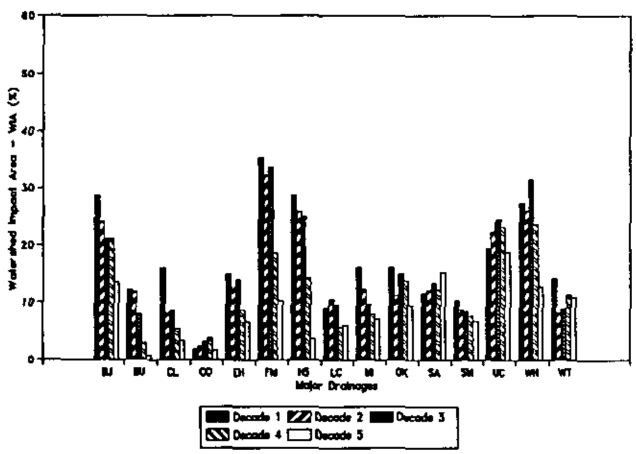


Figure IV-7f graphically illustrates the "watershed impact area" associated with the combined activities of timber harvest and road construction for each major drainage, by decade. Only one of the fifteen major drainages, Fish Creek-Memaloose, will have substantially elevated watershed impact area values approaching 35 percent over a period of three decades. All other major drainages show marked decreases relative to other alternatives.

Forest-wide sediment index values will decrease by 20 percent to 28 percent from current levels, averaging a decrease of 23 percent for the five-decade period, as illustrated by Figure IV-6. Figures IV-8a to IV-8o display and compare the sediment index values for each drainage, by decade.

Alternative H will result in the lowest potential for effects on the water and riparian resources. Moreover, there will likely be a substantial improvement in water quality, channel condition, fish habitat, and other water- and riparian-dependent resources, compared to most other alternatives. There will be a substantial decrease in stream turbidity, virtually no risk of increasing stream temperatures, and a very low risk of removing riparian vegetation due to activity-induced blowdown, channel scouring, and accelerated bank erosion.

Cumulative Effects

Alternative H has the least potential for significant cumulative watershed effects of any of the proposed alternatives. Moreover, it has the greatest potential for contributing to the recovery of drainages which may currently be at risk for cumulative effects. While the total of lands explicitly allocated for riparian management is the least of any of the alternatives, the large amount of riparian compatible "A" allocations affords superior protection to many of the watersheds and riparian areas in the absence of or limited application of timber harvest in these areas. Alternative H will promote the recovery of currently disturbed streamside areas and provide for the future recruitment of large woody material to maintain channel stability. Road construction and timber harvest associated with this alternative will be well-distributed through time and space, reducing the risk of cumulative effects.

Alternative I

Direct and Indirect Effects

Out of a total of 113,150 acres allocated explicitly for riparian area management, approximately 15,300 acres are allocated as Key Site Riparian (A9) areas, with the remaining 97,850 acres allocated to General Riparian (B7) management. An additional 37,800 acres are included in the Special Emphasis Watershed (B6) management area allocation. The Bull Run watershed is managed to maintain riparian resources in order to meet the goal of providing high quality water to the City of Portland. As with Alternatives F and H, this alternative includes substantial levels of "riparian-compatible" allocations, such as Wilderness and Unroaded Recreation, totalling almost 379,500 acres. Much of the apparent reduction in riparian allocations is actually accounted for in these allocations. Refer to Figure IV-3, depicting acres managed to meet water and riparian objectives.

Management activities under this alternative will call for constructing approximately 435 miles of new roads during the five-decade planning period. Over 200 miles will be constructed within the first two decades, with the remaining mileage distributed over the last three decades.

Timber harvest activities within currently unroaded areas will comprise approximately 3,235 acres. This is the third lowest of any of the proposed alternatives, indicative of the large land base allocated to uses compatible with riparian management objectives.

Figure IV-7g Watershed Impact Area by Drainage Alternative I

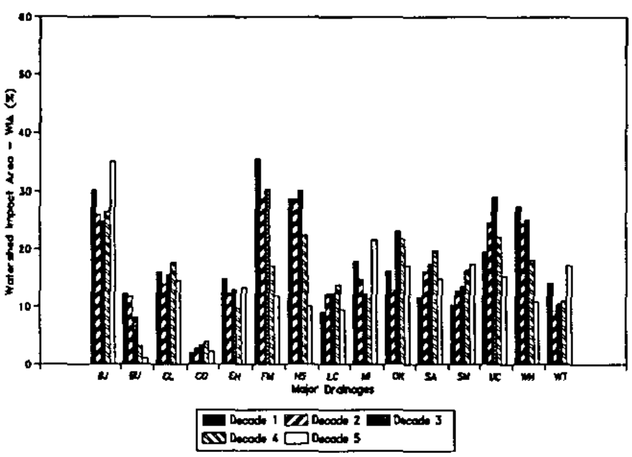


Figure IV-7g graphically illustrates the "watershed impact area" associated with the combined activities of timber harvest and road construction for each major drainage, by decade. Two of the fifteen major drainages (Badger-Jordan and Fish Creek-Memaloose) will have watershed impact area values approaching 35 percent during a single decade. These will be at somewhat increased risk of adverse watershed effects during the critical decades. The remaining major drainages will be maintained at levels averaging 10 to 20 percent.

Forest-wide sediment index values will decrease by 11 percent to 16 percent from current levels, averaging a decrease of 14 percent for the five-decade period, as illustrated by Figure IV-6. Figures IV-8a to IV-8o display and compare the sediment index values for each drainage, by decade.

While this alternative is responsive to issues and concerns related to wildlife and fisheries, potential effects on water and riparian resources will be similar to those predicted for Alternative F. There will be a substantial reduction in stream turbidity compared to current conditions, as illustrated by the sediment index values. There will be a similarly low risk of increasing stream temperatures and a low risk of removing riparian vegetation due to activity-induced blowdown, channel scouring, and accelerated bank erosion. Moreover, accelerated watershed, stream, and fish habitat enhancement programs will likely result in improvement of conditions, especially related to riparian areas, stream temperatures, and habitat condition.

Cumulative Effects

This alternative will be second only to Alternative H with regards to minimizing the potential for significant cumulative watershed effects. In terms of riparian area management, this alternative is very close to Alternative F, having somewhat less riparian land allocated to compatible "A" management areas. Overall harvest and road construction levels associated with this alternative are only slightly greater than Alternative H. Three of the fifteen major drainages will be at a moderate increased risk for cumulative watershed effects. They include, Badger-Jordan, Fish Creek-Memaloose, and Hot Springs Fork. Similar to Alternatives F and H, Alternative I will promote the recovery of currently disturbed streamside areas and provide for the future recruitment of large woody material to maintain channel stability. Road construction and timber harvest associated with this alternative will be well-distributed through time and space, reducing the risk of cumulative effects.

However, the risk will be less than that associated with other alternatives, with the exception of Alternative H.

Alternative Q

Direct and Indirect Effects

Out of a total of almost 122,100 acres allocated explicitly for riparian area management, approximately 16,000 acres are allocated as Key Site Riparian (A9) areas, with nearly 106,100 acres allocated to General Riparian (B7) management. An additional 78,600 acres are included in the Special Emphasis Watershed (B6) management area allocation. The Bull Run watershed is managed to maintain riparian resources in order to meet the goal of providing high quality water to the City of Portland. Included in this alternative are a total of approximately 315,750 acres of "riparian-compatible" allocations, including Wilderness and Unroaded Recreation. Much of the apparent reduction in explicit riparian allocations is actually accounted for in these allocations. Refer to Figure IV-3, depicting acres managed to meet water and riparian objectives.

Management activities under this alternative will call for constructing approximately 525 miles of new roads during the five-decade planning period. Over 290 miles will be constructed within the first two decades, with the remaining mileage distributed over the last three decades.

Timber harvest activities within currently unroaded areas will comprise approximately 4,120 acres. This is a relatively low figure, reflecting the fact that much of the currently unroaded areas will be entered somewhat gradually over the planning period. Moreover, it reflects a transition from unroaded status to a range of allocations spanning the entire spectrum of development options.

Figure IV-7h Watershed Impact Area by Drainage Alternative Q

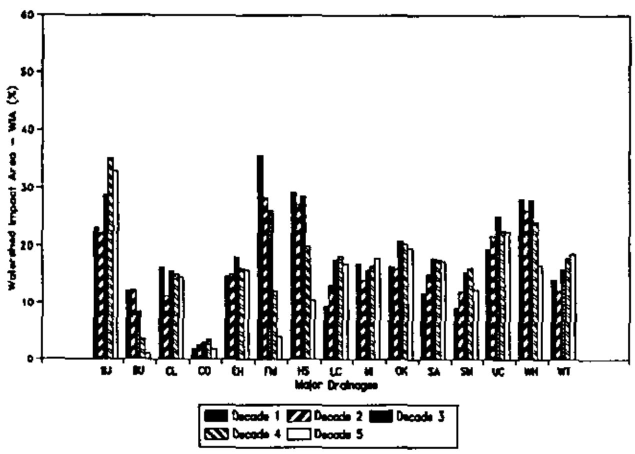


Figure IV-7h graphically illustrates the "watershed impact area" associated with the combined activities of timber harvest and road construction for each major drainage, by decade. The five drainages having the highest levels of management activity include Badger-Jordan, Fish Creek-Memaloose, Hot Springs Fork, Upper Clackamas, and West Fork Hood River. Of these, only Fish Creek-Memaloose and Badger-Jordan will appear to be at increased risk of watershed effects for one or more decades. Most of the drainages will maintain watershed impact areas below the thirty percent level.

Forest-wide sediment index values will decrease by five percent to 14 percent from current levels, averaging a decrease of ten percent for the five-decade period, as illustrated by Figure IV-6. Figures IV-8a to IV-8o display and compare the sediment index values for each drainage, by decade.

This alternative will result in an overall reduction in the potential for environmental effects to water and riparian resources, compared to the current management situation. Moreover, several measures of riparian health will be expected to improve. This alternative will result in a substantial decrease in stream turbidity relative to Alternatives NC, A, C, and E. Short-term, localized increases in stream turbidity will likely be more frequent than those predicted for Alternatives F, H, and I. There will be a low risk of increasing stream temperatures, though somewhat higher than alternatives H and I. Moreover, several streams having seasonal high temperatures will likely experience improvement as riparian areas recover.

Cumulative Effects

The potential for cumulative watershed impacts associated with Alternative Q will be substantially less than that associated with any of the other proposed alternatives except Alternatives H and I. A larger portion of the riparian lands explicitly allocated for riparian management is included as Key Site Riparian. Alternative Q also allocates the greatest amount of Special Emphasis Watershed, reflecting consideration for the inherent physical characteristics and sensitivity of various watersheds. These sensitive watershed areas have watershed impact area dispersion constraints of either 18 percent or 25 percent, depending on the inherent sensitivity of the various watersheds. As a result, overall distribution of activities through time and space should greatly reduce the potential for cumulative effects.

Mitigation Measures

The National Forest Management Act (NFMA) of 1976 requires that timber harvesting and other management activities will occur only where watershed conditions will not be irreversibly damaged. Each alternative has the potential to affect the quantity and quality of water and the conditions of floodplains, wetlands, and other riparian areas. Potential effects include the risk of periodic violations of state and federal water quality standards and the degradation of the stream channels and riparian areas. Mitigation measures are designed and intended to minimize the risk of adverse effects on the water resources.

Figure IV-8a Sediment Index by Alternative Badger-Jordan (BJ)

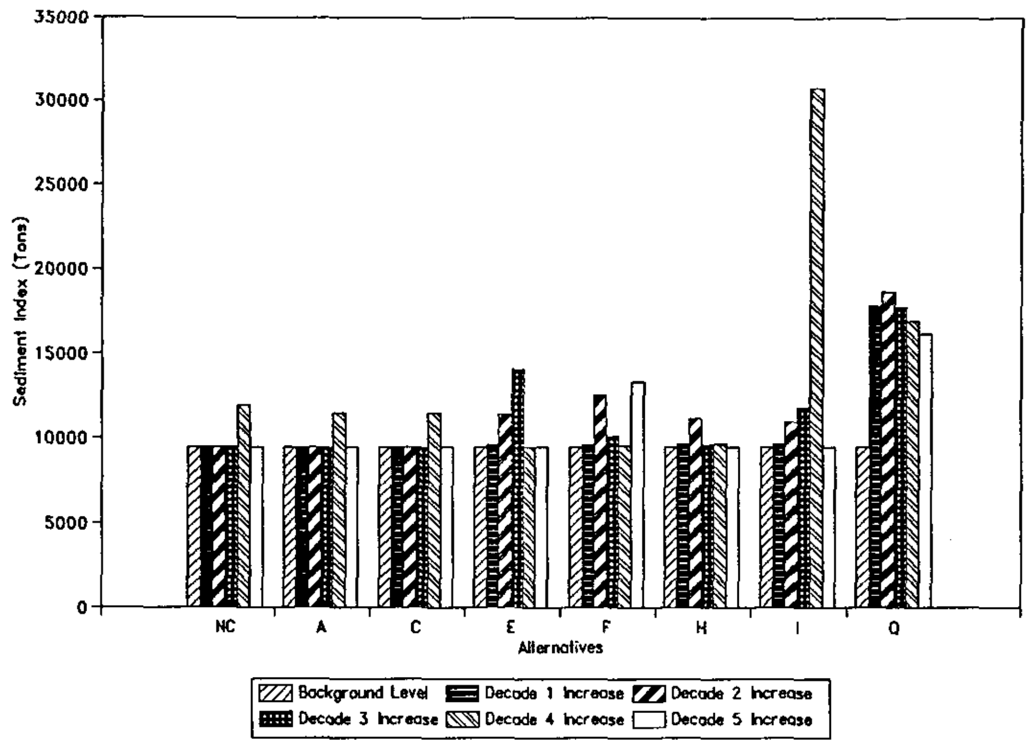


Figure IV-8b Sediment Index by Alternative Bull Run (BU)

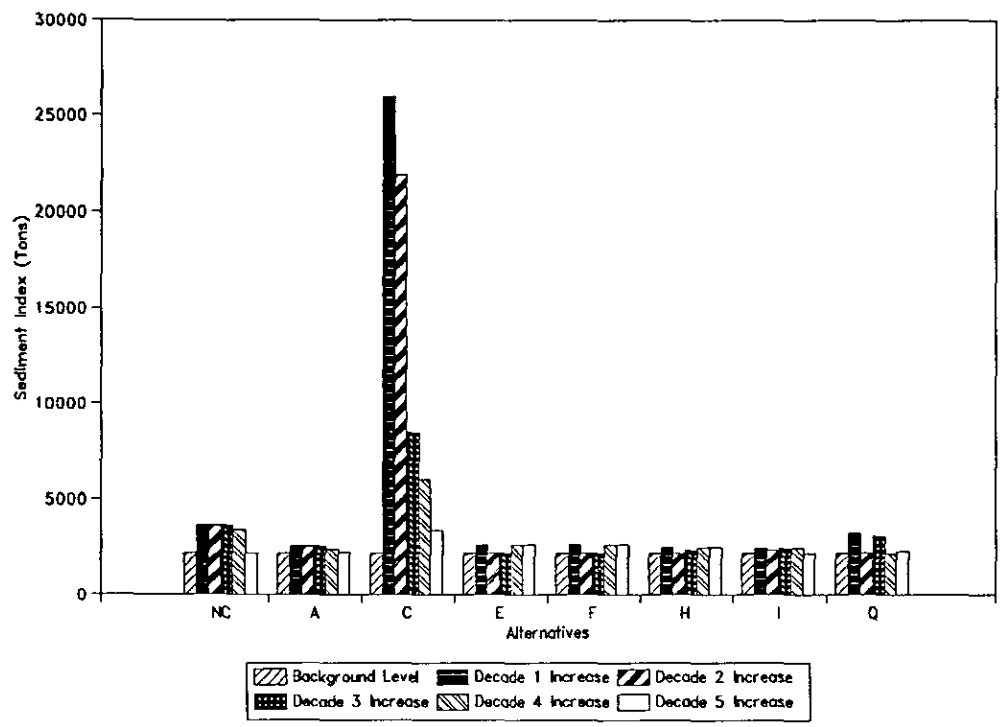


Figure IV-8c Sediment Index by Alternative Collawash River (CL)

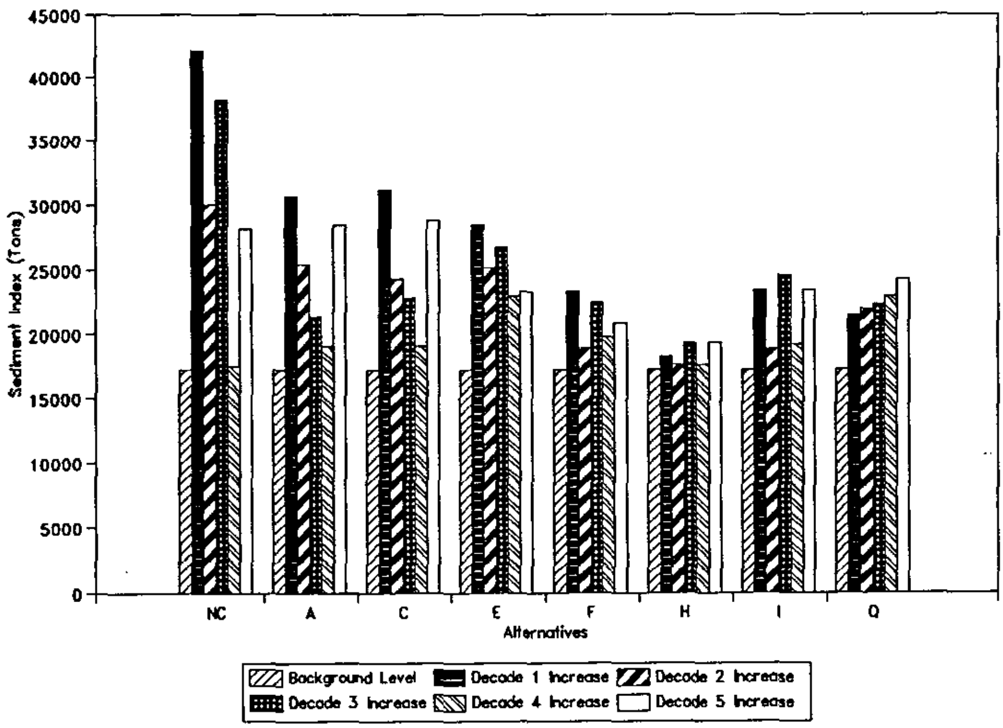


Figure IV-8d Sediment Index by Alternative Columbia River (CO)

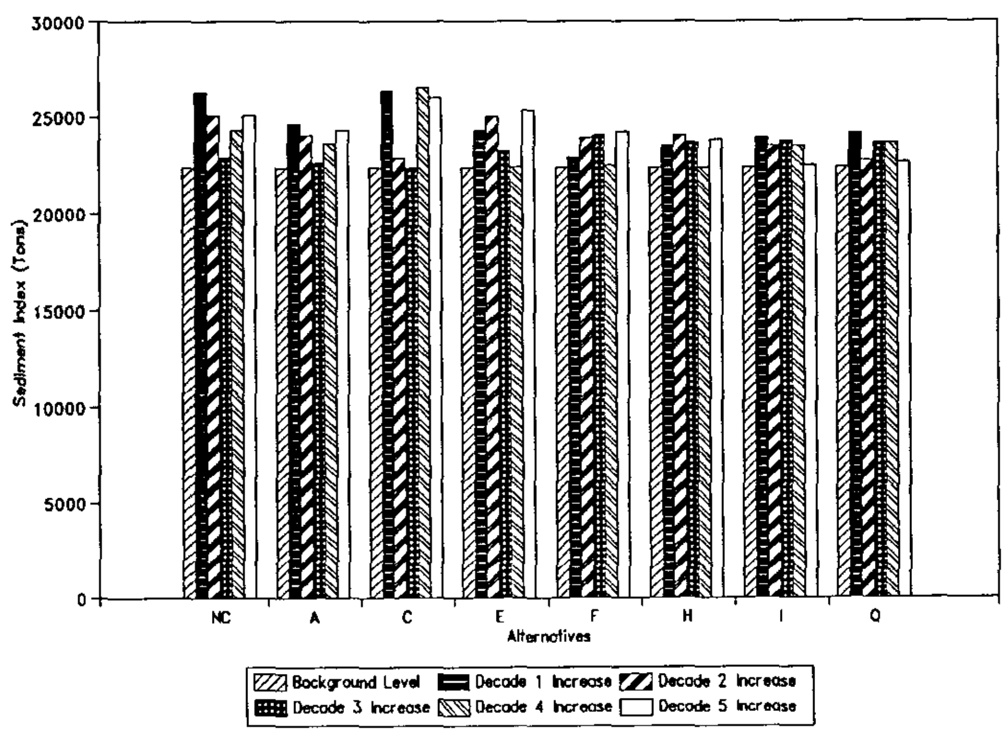


Figure IV-8e Sediment Index by Alternative East Fork Hood River (EH)

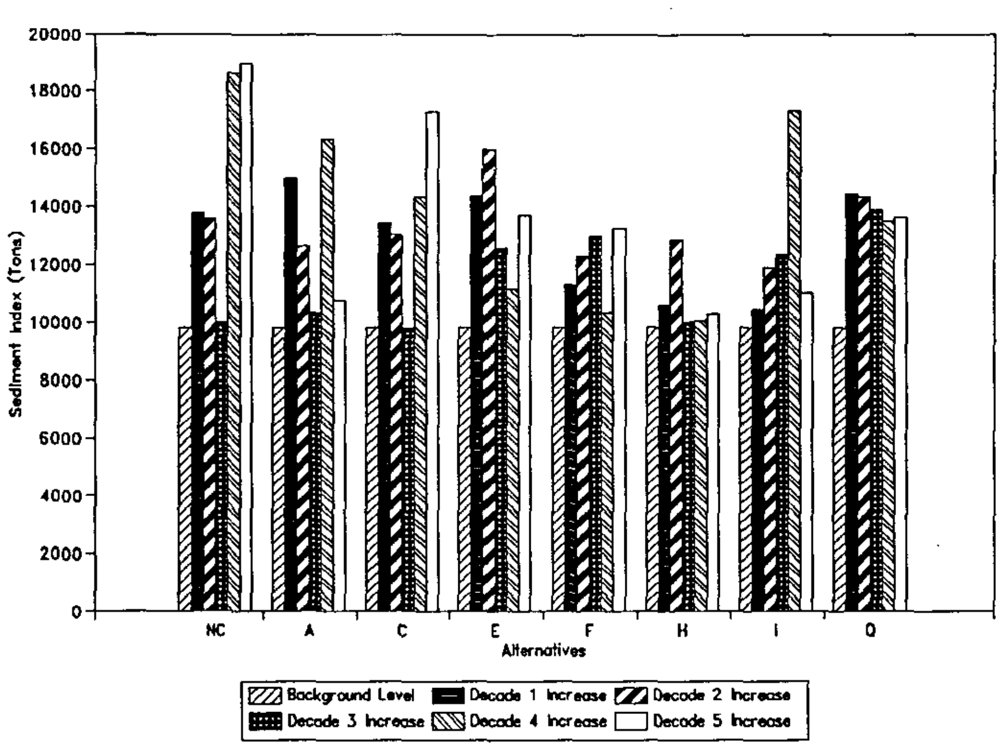


Figure IV-8f Sediment Index by Alternative Fish Creek-Memaloose-Molalla (FM)

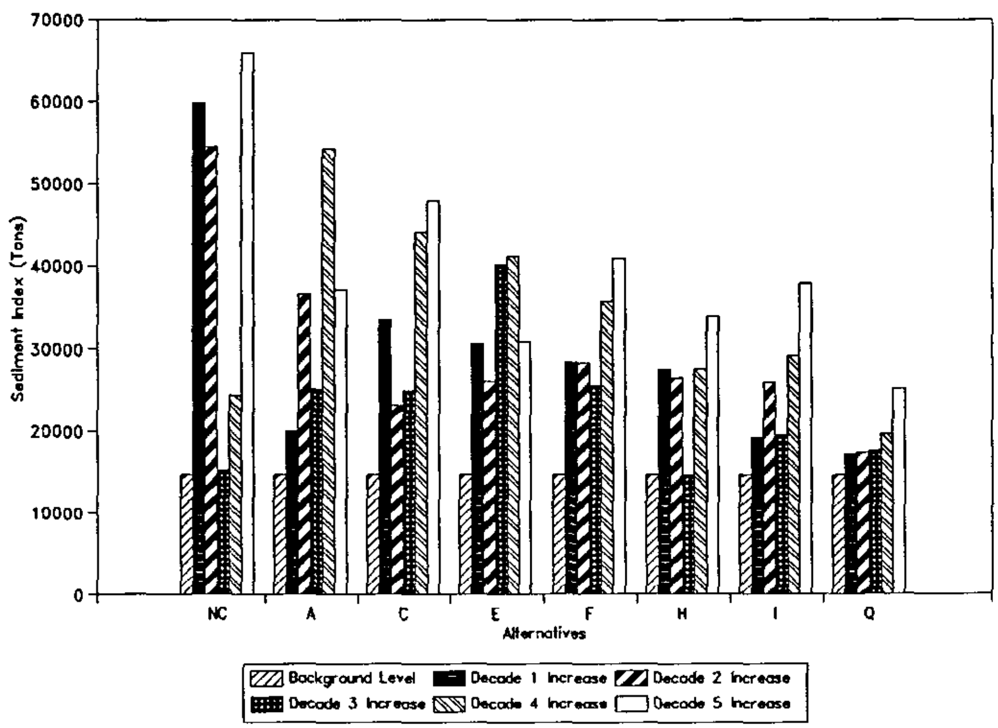


Figure IV-8g Sediment Index by Alternative Hot Springs Fork Collawash (HS)

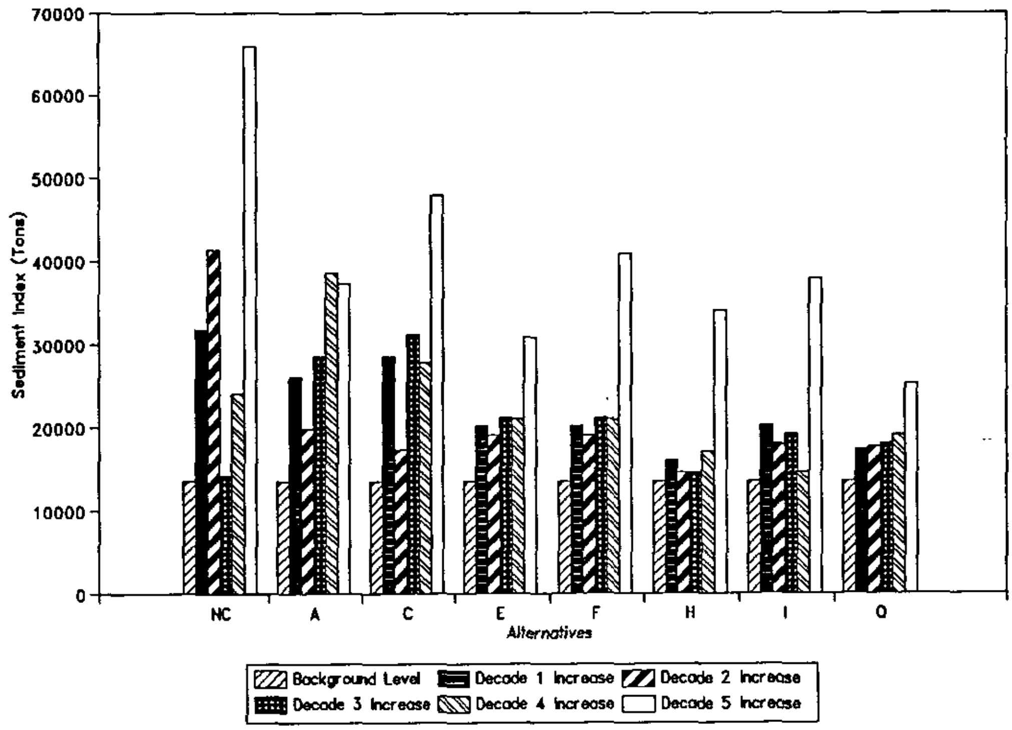


Figure IV-8h Sediment Index by Alternative Lower Clackamas (LC)

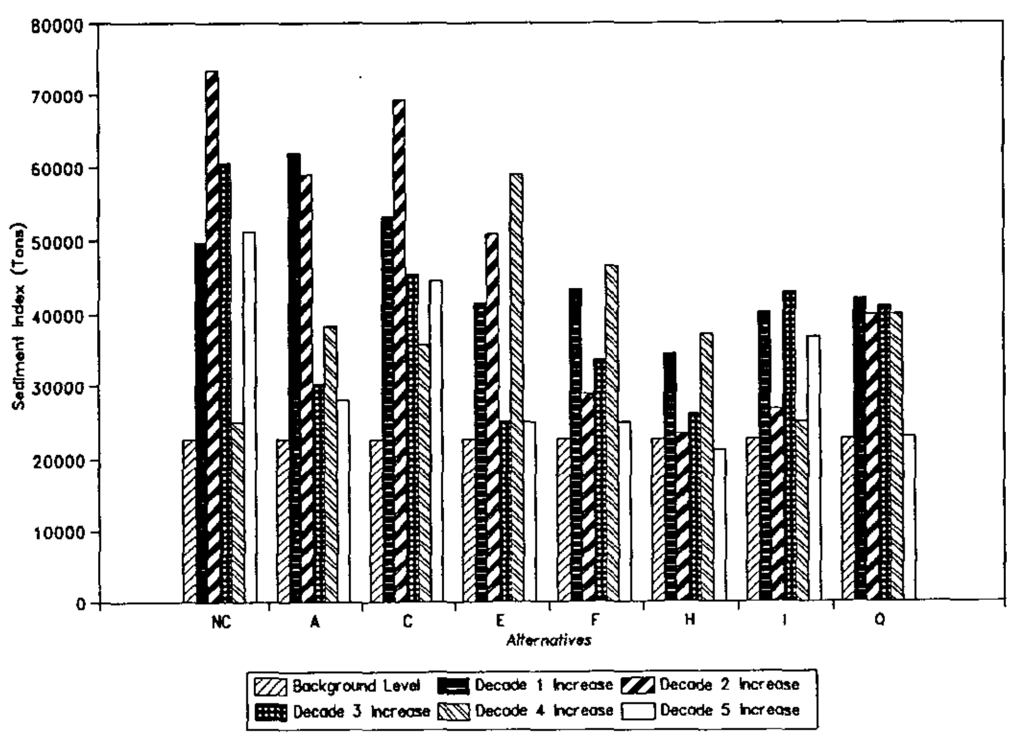


Figure IV-8i Sediment Index by Alternative Miles Creeks (MI)

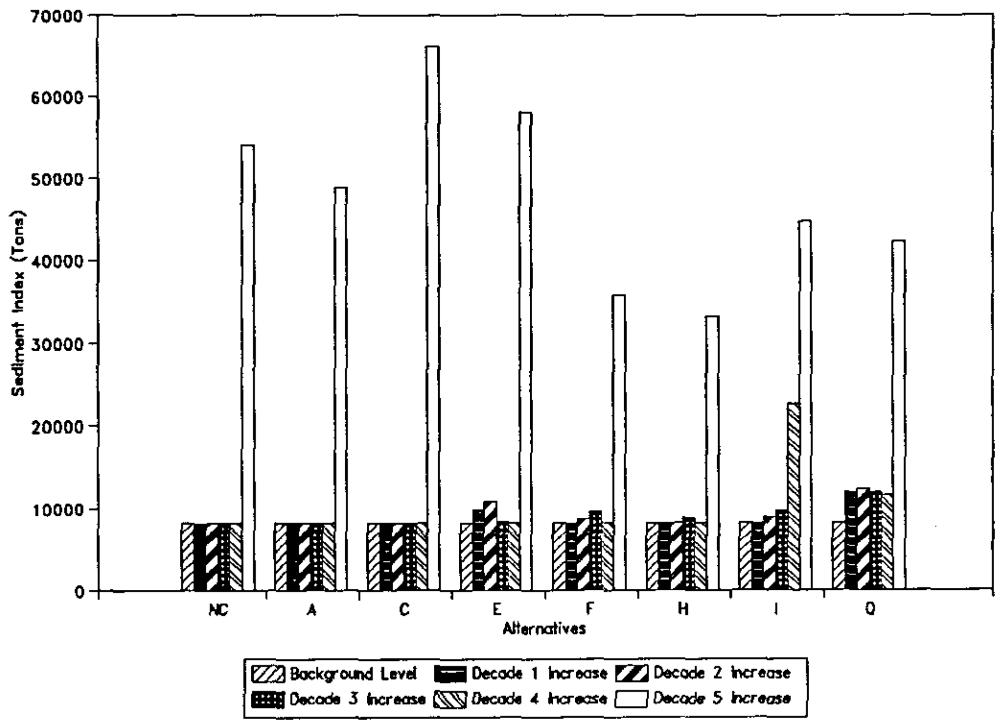


Figure IV-8j Sediment Index by Alternative Oak Grove Fork Clackamas (OK)

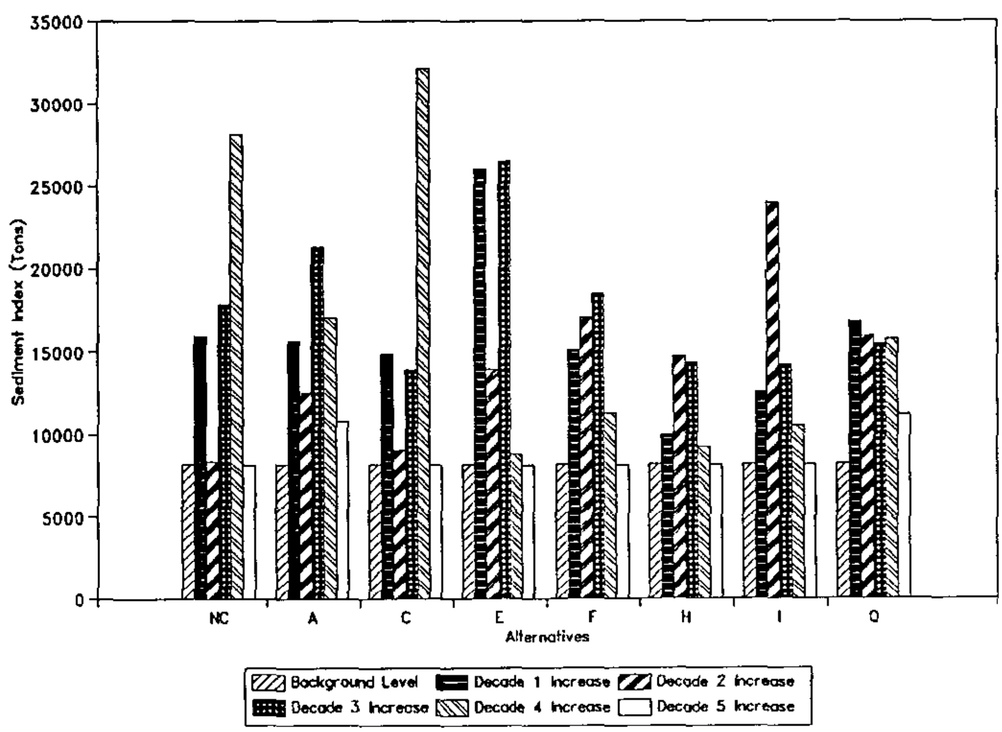


Figure IV-8k Sediment Index by Alternative Sandy River (SA)

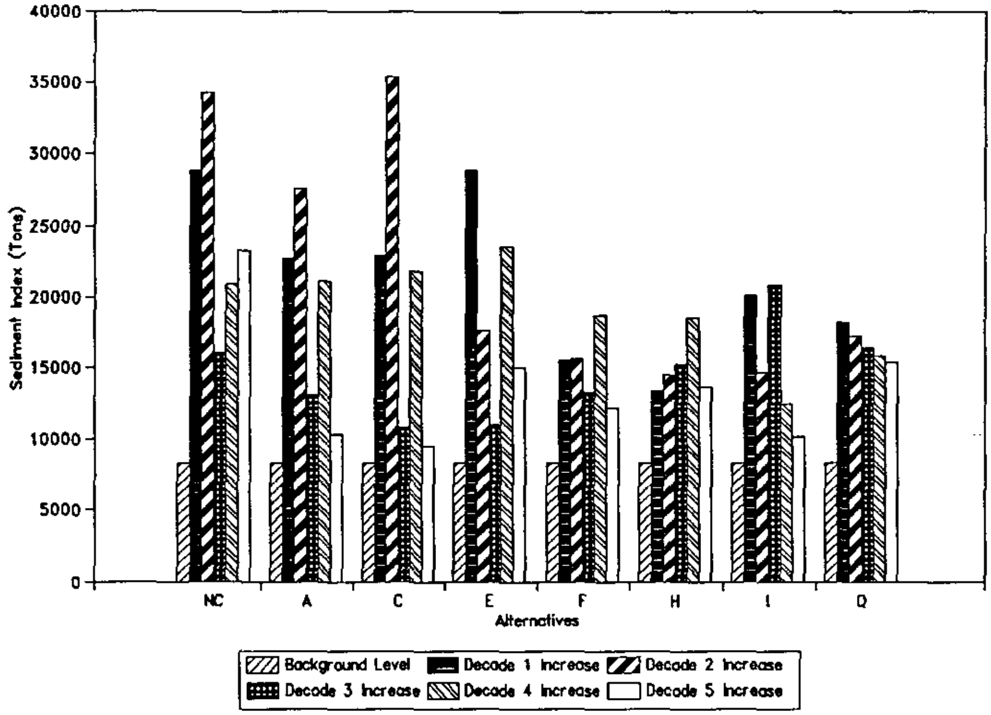


Figure IV-8l Sediment Index by Alternative Salmon River (SM)

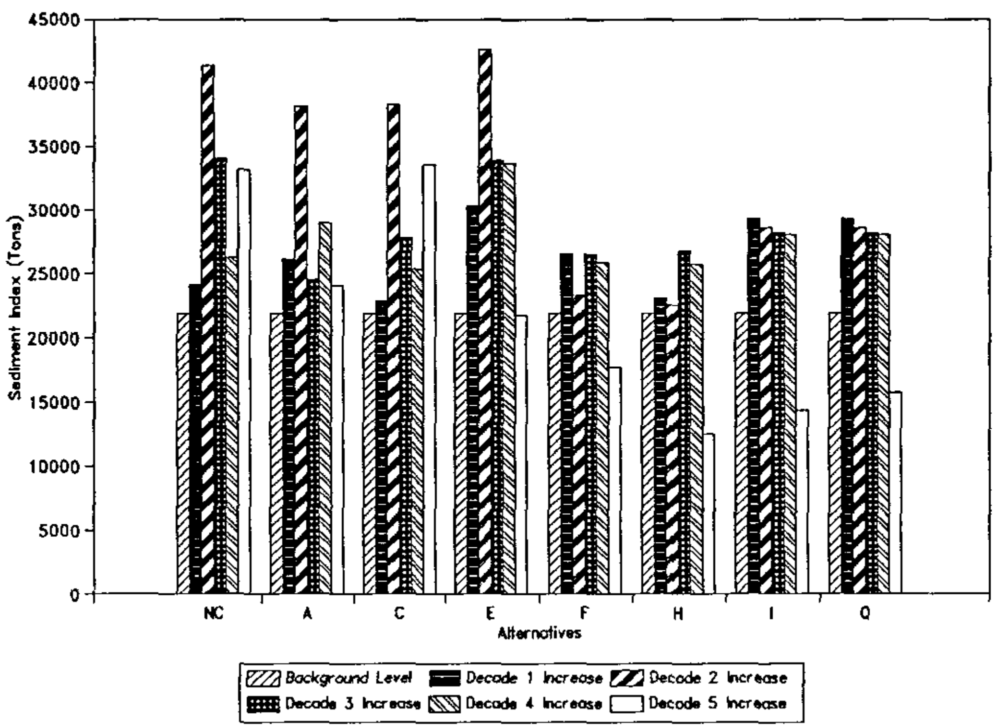


Figure IV-8m Sediment Index by Alternative Upper Clackamas (UC)

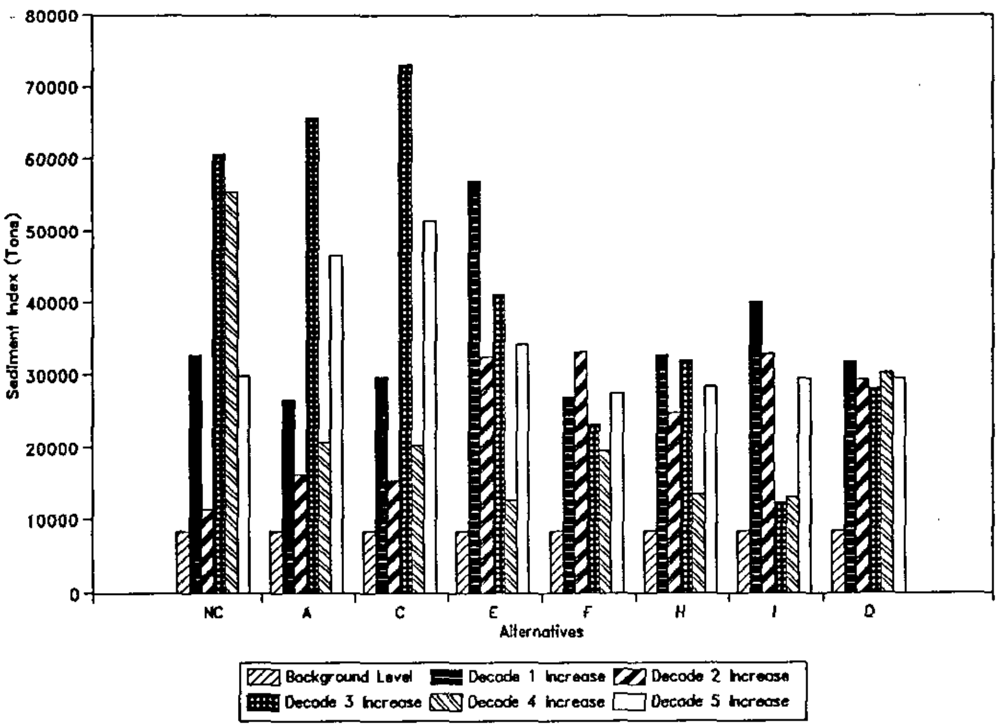


Figure IV-8n Sediment Index by Alternative West Fork Hood River (WH)

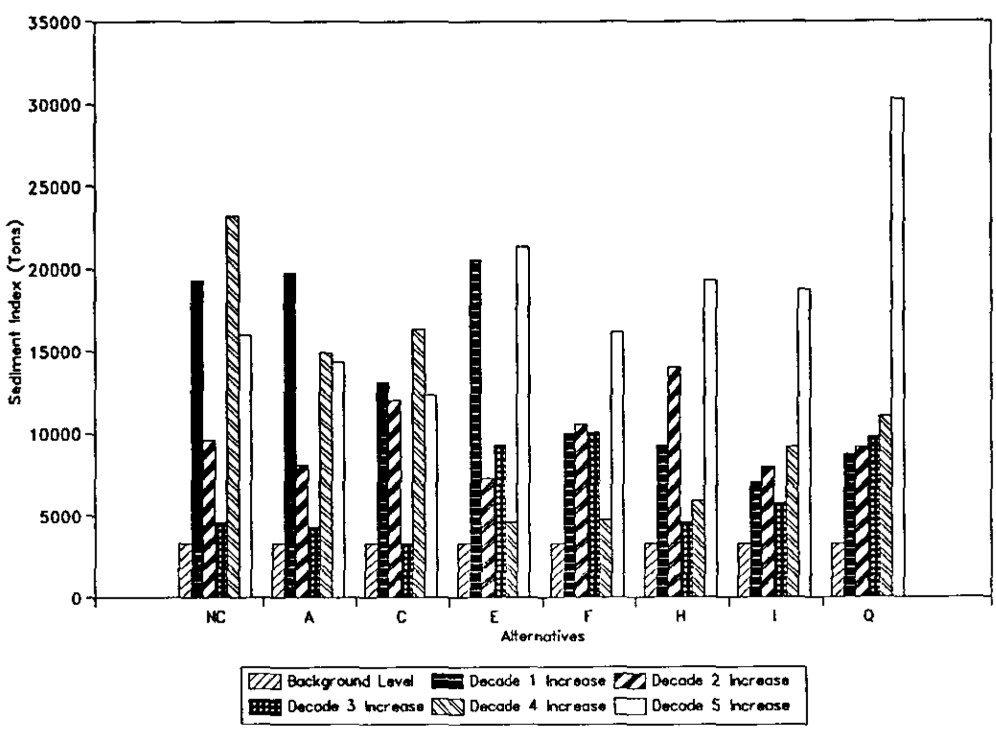
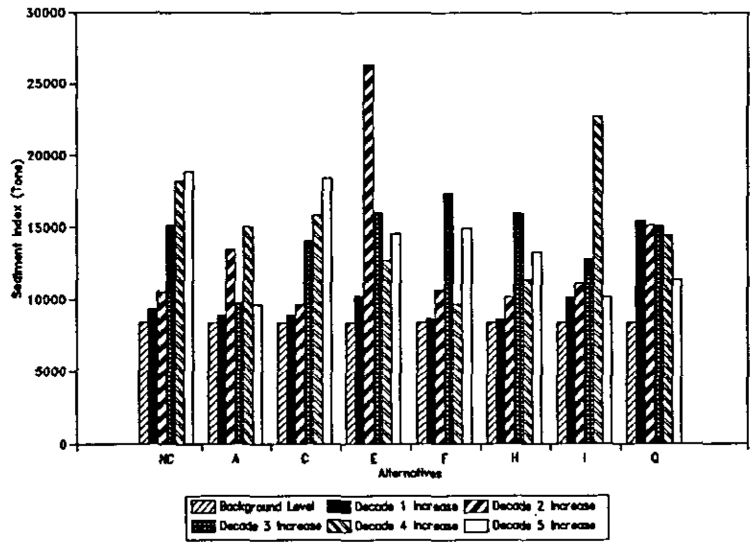


Figure IV-8o Sediment Index by Alternative
White River (WT)



The most important means by which water quality will be protected is the implementation of Best Management Practices (BMPs) associated with various management activities. Protection of water quality with BMPs is a management requirement and applies to all alternatives. Appropriate, site-specific BMPs are developed and implemented at the project level to best meet site conditions and resource needs. General BMPs are described in the document General Water Quality Best Management Practices, USDA Forest Service, Pacific Northwest Region. Best Management Practices will eliminate or minimize impacts to water quality. They augment and complement Forest-wide and Management Area standards/guidelines (Chapter 4, Forest Plan). A discussion of BMPs and their application in protecting water quality is presented in Appendix H.

Mitigation measures, which include designation of streamside management units or riparian management areas (vegetative buffer strips) along streams or around other water bodies, reduced harvest levels and frequency of entry, use of designated skid trails, and specific criteria for stream crossings, are designed to achieve a high rate of success (90 percent or greater). The success of particular applications, however, varies. Unexpected or unusually severe climatic events, availability of funding and staffing, knowledge and understanding of a measure by operators and administrators are factors which can reduce effectiveness. In addition to mitigation built into the Standards and Guides, specific measures can be taken on site or at the project if conditions indicate the need to do so.

Specific measures to mitigate potential increases in stream temperature may include implementation of timber harvest prescriptions which maintain riparian shade, or revegetation of disturbed riparian areas with rapidly growing deciduous vegetation to provide summer shade in minimal time.

Measures to minimize direct disturbance to stream channels may include use of yarding equipment capable of suspending logs over the channel and streambanks, and directional felling of harvest trees. Mitigation of surface erosion from harvest units or other site disturbances is accomplished by measures which retain or replace soil cover. The choice of yarding system (e.g. tractor or aerial system) and fuel reduction method directly influence the potential for soil erosion. Maintenance of streamside and riparian groundcover vegetation and woody material can be effective in preventing the transport of soil to streams.

The potential for sediment delivery to the stream system through mass wasting or the occurrence of debris torrents can be mitigated by retaining the root strength of live trees in potentially unstable areas, as identified during project planning. Specific prescriptions will consider the interaction of root strength, soils, geologic characteristics, groundwater, and proximity to a stream, lake, or wetland, etc. Retention or addition of large woody material, and provisions to ensure future recruitment of large woody material can reduce the frequency of debris torrents, particularly in steep headwater stream channels (Class III and IV). This, in turn, reduces the rate at which debris torrents enter Class I and II streams.

To reduce the sediment production potential associated with roads or other site developments, extensive and intensive mitigation measures will be incorporated in project design. This should reduce sediment production, but may increase costs. One of the key factors is avoidance of sensitive, unstable areas. Other mitigations may include, but are not limited to, special road design and construction considerations at stream crossings, on steep slopes, or associated with potentially unstable areas (e.g. earthflows, etc.). Typical construction considerations include specified compaction of fills and prevention of soil sidecasting on steep slopes and adjacent to streams. Providing stable road surfaces through paving or rocking, while initially more costly, reduces overall impacts on water quality and runoff over time. Mulching and revegetating road cutbanks, fillslopes, or other disturbed soil surfaces near stream crossings, follow-up applications of fertilizer to vegetated roads cuts and fills, slash filter windrows below road fills, and obliteration of temporary roads following harvest activity are additional examples of effective mitigation measures. No new parallel road construction will be allowed in the streamside management unit/riparian zones of perennial streams.

Mitigation after the fact is often not as effective in reducing impacts as conducting the activity in a manner which reduces or controls the impact. Ripping and tillage following harvest is seldom as effective in maintaining the hydrologic properties of a soil as is the use of designated skid trails to control the amount of an area impacted.

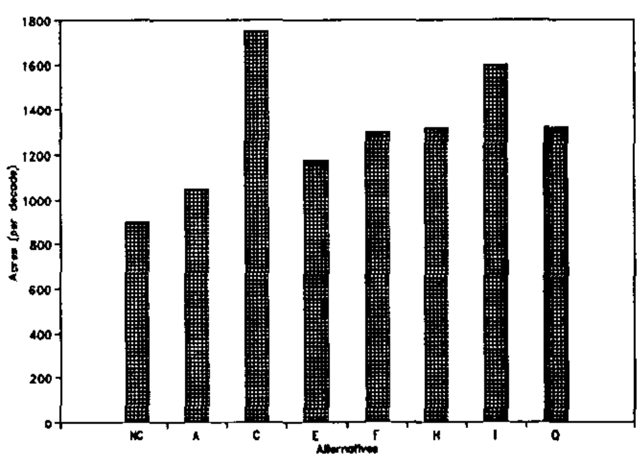
Mitigating Cumulative Effects

Mitigation of direct effects, such as in the previous discussion, is the primary method of ensuring that cumulative effects do not have significant impacts. The practice of dispersing activities, (primarily timber harvest and road construction) over time and throughout the landscape (Christner 1982; Rice 1980) is one means of mitigating some of the potential direct, indirect, and cumulative effects. The methodology developed for assessing watershed sensitivity and estimated threshold levels for watershed disturbance (see Watershed Impact Area, in Glossary) provides a framework for assessing cumulative effects and dispersing activities over time and space. While this technique has been modeled in FORPLAN to assess various proposed alternatives, project level planning is the most appropriate level for a focused cumulative effects analysis and site-specific design of mitigation measures and BMPs. The intent is for project plans to consider activities on both National Forest land and non-National Forest land within major watersheds and subdrainages during a cumulative effects analysis. The effects of increased peak flows and sediment will be mitigated primarily by dispersion of activity.

A very important mitigation measure which will be applied to all Alternatives is avoidance. Simply put, if the risk of producing undesirable effects are too great, the project or a portion of the project, will not be implemented.

In addition to mitigation measures, many alternatives incorporate features (e.g. soil and water improvement projects, etc.) which could contribute to an overall improvement in watershed condition, as illustrated by Figure IV-9.

Figure IV-9 Soil & Water Improvement Acres of Activities by Alternative



Monitoring

Monitoring serves as the principal means by which the Forest assesses whether the Standards and Guidelines are being implemented as prescribed, and whether they are effective in achieving the desired results and predicted effects. Implementation of the Standards and Guidelines will be monitored through activity reviews and both intensive and extensive water quality monitoring and stream surveys. Monitoring serves as a check on the effectiveness of mitigation measures. It identifies necessary adjustments in the level and type of mitigations required to meet management objectives.

A major focus of monitoring is directed at testing the accuracy of various assumptions driving the cumulative effects assessment. Cumulative effects will be tracked by monitoring at the project/watershed level. Assessment of risk and assurance of optimum distribution of timber harvest impacts among watersheds will occur. The intent is to avoid or minimize the potential for cumulative effects (See Chapter 5, Forest Plan).

Potential Conflicts with Plans and Policies of Other Jurisdictions

Please refer to the end of this chapter for a discussion of the possibility of conflicts between the alternatives and the plans and policies of other jurisdictions with responsibility or authority for this environmental component.

Riparian Areas

Introduction

This section describes the potential direct, indirect, and cumulative effects of the proposed alternatives on the character and functioning of riparian areas. Riparian areas, floodplains, and wetlands form the transition between the upslope terrestrial ecosystem and the stream, lake, or wetland ecosystems. Riparian areas provide shade, large woody material, and small organic material to aquatic habitat. Riparian areas are also a particularly diverse part of the terrestrial ecosystem, providing critical plant and wildlife habitat diversity and a substantial portion of the Forest's dispersed recreation. Riparian areas commonly have highly productive timber sites and frequently are the most economic road locations (along floodplains, stream crossings, etc.). There are also discussions of riparian areas and values in the Water, Aquatic Resources, and Vegetation sections of this chapter.

Significant Interactions

Trees in riparian areas provide input of large woody material to the floodplain, channel, and water. Large woody material is recruited into stream channels as trees are blown over, or the tops are broken out. This material influences the creation and stability of aquatic habitat conditions such as pools, side channels, and well-sorted gravels, and influences the stability of stream channels by armoring streambanks and dissipating the velocity of water.

Practices within or adjacent to riparian areas which have the potential to affect water quality and stream conditions are those which influence shade, streambank stability, the rate of input of large woody material, floodplain characteristics, and wetland characteristics. These are discussed further on in this section and elsewhere in this chapter under the headings of water, fish, and vegetation.

The main forested component of vegetation immediately adjacent to streams are alder and cottonwood stands. These areas also encompass various shrub types like willow, as well as sedges, rushes, and other vegetation that grows where supported by seasonal flooding or shallow water. Riparian areas also include wetlands (marshes, bogs, wet meadows, ponds, etc.), lakes and reservoirs, and seeps and springs within the Forest or streamside portions of previously described vegetation zones, though species composition is different. On the west side, streamside parts of the western hemlock zone and Pacific silver fir zones are often dominated by western red cedar. East side riparian areas are often bordered by Engelmann spruce, western red cedar, and lodgepole pine. At high elevations, riparian sites grow Sitka alder, Engelmann spruce and occasionally, Alaska yellow cedar.

Riparian vegetation is needed for the maintenance of water quality, fish habitat, and wildlife habitat. All alternatives provide different levels of management emphasis for these resources, but the effects of the emphasis varies substantially between alternatives. Most effects in riparian zones will be of lesser magnitude than in other vegetation zones due to several factors. When timber is harvested, unit size will be relatively small, streams will be shaded by buffer strips, uneven-aged management will be used in many locations, and slash treatment will not be as intensive. These practices will leave more woody material in streams and on the ground for wildlife habitat. The extent of riparian area identification and allocation, and the relative management intensity within and adjacent to these areas will vary by alternative.

Related ICOs

- Maintenance and rehabilitation of fish habitat and water quality.
- Maintenance of high quality water from forest lands for domestic water supplies.
- Maintenance of minimum flows and hydrologic balance.

Alternative NC

Direct and Indirect Effects

Alternative NC continues current vegetation management. The alternative does not incorporate any of the recent land suitability classifications nor does it implement any of the current management direction. Under this alternative, intensive levels of timber management would be maintained for most riparian zones and their associated areas. About 5,000 acres of streamside management areas, associated with unstable landslide features, would be excluded from harvest to protect them until a satisfactory harvest method is developed.

The character of riparian vegetation would show increasing alteration on two-thirds of the Forest or more. The diversity of vegetation by types and age-classes, and streambank cover and stability would be reduced. These changes would be most visible in drainages of the Clackamas River and least visible in the Columbia and Bull Run drainages and the Dalles Watershed (a portion of the Miles Creek drainage).

Cumulative Effects

Alternative NC has the greatest potential for creating adverse cumulative effects to the riparian component of the Forest. None of the improved land classifications, allocations, or management techniques are provided in this alternative with the exception of 5,000 acres of unstable lands adjacent to streams. Most streamside riparian areas are available for intensive timber management Cumulative effects associated with this alternative will likely include loss of a substantial portion of the potential large woody material required to maintain terrestrial and aquatic habitats and channel stability, leading to a substantial risk of increased stream temperatures, a further decline of aquatic and terrestrial habitat, and an increased risk of removing additional riparian vegetation due to activity-induced blowdown, channel scouring, and accelerated bank erosion.

Alternative A

Direct and Indirect Effects

This alternative is essentially a continuation of current vegetation management with the notable exception that Management Requirements (MRs) are included in the volume calculations and an updated land base is used for suitable acres. Under this alternative, intensive levels of timber management would be maintained for most riparian zones and their associated areas. About 5000 acres of streamside riparian areas would be excluded from harvest due to unstable slopes. The character of two-thirds of the riparian vegetation would eventually show alteration. The diversity of vegetation by types and age classes, and streambank cover and stability would be reduced. These changes would be most visible in drainages of the Clackamas River and least visible in the Columbia and Bull Run drainages and The Dalles Watershed.

Alternative C

Direct and Indirect Effects

Of all the alternatives, this one designates the second largest number of acres for timber harvest. The relatively unconstrained timber theme of this alternative allows relatively greater amounts of timber harvest and related disturbance within and adjacent to many riparian areas. Throughout the Forest, riparian areas associated with seeps, springs, and intermittent streams would show increasingly visible alteration in the composition and structure of their vegetation. These areas would support earlier successional stage vegetation, larger and more frequent openings, and more deciduous trees.

A major portion of available unroaded areas will be entered and managed for maximum harvest rates, consistant with other intensively managed areas. Since many of the unroaded areas contain relatively unstable lands, riparian areas would be at increased risk of degradation associated with management activities.

Cumulative Effects

The cumulative effects of this intensive management will include a high risk of increasing stream temperatures, a substantial reduction in the amount of large woody material available for channel stability and habitat maintenance, leading to an accelerated loss of valuable and diverse terrestrial habitat, a high potential of fish habitat degradation, and an increased risk of loss additional loss of riparian vegetation due to blowdown, channel scour, and accelerated bank erosion.

Alternative E

Direct and Indirect Effects

Alternative E is similar to Alternative A in both management emphasis and environmental effects related to riparian resources. Riparian areas associated with seeps, springs, and intermittent streams within areas selected for intensive timber management would often have earlier successional state vegetation and larger and more frequent openings, as compared to most other alternatives. While riparian areas associated with lakes and Class I, II, and III streams will be managed to protect riparian values, the overall increased emphasis on timber harvesting of adjacent areas will increase the risk to these riparian areas.

Cumulative Effects

The cumulative effects of timber harvesting in the riparian areas associated with Class IV streams, seeps, and springs will decrease the availability of large woody material for providing channel stability. The cumulative effects of riparian management will likely result in reduction of diverse terrestrial habitat, somewhat elevated water temperatures in some streams, and an increased risk of additional blowdown, accelerated channel scour, and accelerated bank erosion.

Alternative F

Direct and Indirect Effects

The emphasis of this alternative on roaded recreation and visual management can be seen in its reduction of acres to be harvested. The existing character and function of most riparian vegetation would be maintained or improved. Harvest which occurs in riparian areas would create small, patchy openings, a diversity of vegetative types and age-classes, and stable, well-vegetated stream banks.

Cumulative Effects

Effects will include a low potential for degradation of aquatic or terrestrial habitat within riparian areas and a low risk of removing additional riparian vegetation due to activity-induced blowdown, channel scouring, and accelerated bank erosion. Overall, Alternative F will exhibit a general improvement in riparian conditions, water quality, and steam channel stability.

Alternative H

Directs and Indirect Effects

This alternative produces substantially different effects on vegetation than those resulting from most of the other proposals. Less than half the possible acreage will be designated suitable for timber management, as this alternative removes all old-growth and much of the steeper, unroaded areas from consideration as a timber resource. The alternative requires reduced rates of harvest from riparian areas adjacent to lakes, streams, wetlands, and their associated vegetation. Riparian areas associated with intermittent streams, seeps, and springs in areas where intensive timber management would take place will often have earlier successional stage vegetation.

Cumulative Effects

This alternative affects or disturbs vegetation less than any other proposed plan. It would produce more acres of older stands and bigger trees than would any other alternative. Harvest of riparian areas would utilize small units and individual tree removal so that patchy openings, a diversity of vegetative types and age classes, and stable, well-vegetated stream banks would result. Increases in early successional stage vegetation, and the size and frequency of openings would occur in some intermittent stream riparian areas. The cumulative effects would lead to a substantial improvement in riparian-dependent resources, including improved water quality, channel condition, and aquatic and terrestrial habitat.

Alternative I

Direct and Indirect Effects

Alternative I represents a response to public issues that relate to maintenance and enhancement of fish and wildlife habitat with the result that all areas considered to be important components of these habitats would be managed primarily to meet these resource goals. This alternative also emphasizes visual quality and unroaded recreation opportunities to the maximum. Timber harvest would be eliminated in some areas designated for fish and wildlife management in order to develop maximum fish and wildlife habitat capability. In such areas, vegetation would be predominately mature and old growth with considerable riparian vegetation in streamside locations.

The existing vegetative character of all kinds of riparian areas including streams, lakes, reservoirs, seeps, springs, and wetlands would be maintained or improved. Most riparian areas would progress naturally toward later successional stages. Throughout the Forest, diverse types of vegetation and age-classes would increasingly dominate the character of riparian growth.

Cumulative Effects

This alternative is second only to Alternative H with regards to minimizing the potential for cumulative effects on the riparian resource. In terms of riparian area management, this alternative is very close to Alternative F. The result is that there will be a similarly low risk of loss of riparian vegetation, diversity and structure, and a similar low risk of activity-induced blowdown, channel scouring, and accelerated bank erosion. Moreover, this alternative, more than any other, will promote the recovery, of currently disturbed riparian areas and streamside areas and provide for the future recruitment of large woody material to maintain channel stability and aquatic/terrestrial habitats.

Alternative Q

Direct and Indirect Effects

Through application of a variety of riparian management allocation and riparian-compatible management area prescriptions, near-natural riparian characteristics will be maintained or restored, where current lacking. Management of vegetation on extended rotations will provide for future recruitment of large woody material and overall benefits to both terrestrial and aquatic ecosystems. Riparian shading will result in maintenance of stream temperature, and likely reductions in temperatures of streams currently at risk due to lack of riparian vegetation. There is a high potential for maintaining channel stability and reducing channel scour and bank erosion.

Cumulative Effects

This alternative will result in an overall reduction in the potential for adverse cumulative effects on riparian areas and riparian-dependent resources. Maintaining the structure and diversity of riparian areas will result in a low risk of increasing stream temperatures and a high potential for achieving habitat diversity and stability of both aquatic and terrestrial ecosystems. Stream channel stability and overall water quality will continue to improve as a result of the riparian management strategy incorporated into this alternative.

Mitigation Measures

Location of clearcut units, roads, campgrounds, and other facilities away from streams is the most valuable method of mitigating their impacts on streamside vegetation. Timber harvest impacts can be reduced by marking trees to be left for riparian habitat structure. Log suspension during yarding and directional felling can reduce damage to streamside hardwoods such as alder and cottonwood. Measures to control grazing include adjustment of grazing periods, fencing, and reduction of total stock numbers.

Other mitigation measures in this zone would be to design harvest units which avoid blowdown adjacent to the unit. Keeping harvest units small, or perhaps using the group selection silvicultural system to maintain desired vegetation along a stream, are other mitigation measures. Planning for future harvest during initial entry would help with multiple entries and thereby mitigate potential damage to riparian resources.

The effectiveness of group selection and uneven-aged management harvest methods has not been widely proven, but they are desirable for aesthetic purposes, for maintaining continuous shade on a stream, for maintaining wildlife cover, or for maintaining trees as an evapotranspiration *"pump"* to reduce the water content of soils in unstable areas.

Vegetation

Introduction

Vegetation is affected by human activities. Some effects are direct and immediate; others are indirect and may be subtle. Many are cumulative, but some of the cumulative effects recover over time to a desirable or acceptable condition.

The most significant direct effects result from activities that cause the most change in the vegetation community. For example, timber harvest changes the amount, mix or kind, distribution, structure, and quality of vegetation. The same relationships are generally true for activities that affect grasslands, shrubs, subalpine and riparian areas.

A new plant community develops over time in a predictable fashion determined by plant association, the original community, treatments applied to it, and conditions following. Indirect effects like the development of a plant community spin-off on the animal community, hydrologic balance, viewing quality, and so forth.

The effects of our activities on vegetation are cumulative in a time scale measured by days, seasons, or years. But plant communities are dynamic. Plants grow, create their own ambience, reproduce, die, and cycle their remains through succeeding generations. Plant communities respond to the count of decades and centuries. Left alone, they eventually return to natural patterns and cycles.

We interact with vegetation in the human time scale. Within that frame of reference, the alternatives have cumulative effects. Unlike mineral wealth which can never be replaced after we consume it, vegetation can come back if site and microclimatic conditions have not been altered beyond the potential recovery threshold.

Related ICOs

- Level of timber supply.
- Develop and implement a full range of silvicultural systems including uneven aged management.
- Use vegetative management to maintain or improve habitat throughout the Forest.

Significant Interactions

Vegetative change comes about through natural processes and through our consumption and use of forest resources. Natural processes predominate in Wilderness, Research Natural Areas, and Management Areas where our use of vegetation is primarily nonconsumptive. Unless wildfire, windstorm, floods, insect attacks, or other natural catastrophes intervene, change occurs very slowly. These dramatic events cause abrupt change that resides within the definition of natural process.

In addition to on-site activities, adjacent or nearby activities may also have an influence on vegetation. For example, a clearcut could raise the water table in a nearby marsh by interrupting moisture uptake and transpiration functions performed by the trees, which may then trigger a change in vegetation type.

Other types of resource uses such as recreational activity and livestock grazing tends to be limited to specific localities. Where demand exceeds supply some vegetative effects may occur.

The harvest of forest resources and other consumptive uses can cause a broad range of vegetative change. Some changes are very localized but others are widespread. Activities causing major change are cutting, burning, applying chemicals, mechanical preparation, and planting. The relative significance of change relates to the level of consumptive activity and the intensity of resource use defined by the alternatives.

Old-growth, a stage of vegetation with high economic, biological, ecological, and social value, is subject to profound change. Because of its regional and national importance, old-growth is treated separately in this chapter.

Description of Harvest Methods and Silvicultural Systems

Even-Aged Management

Even-aged management takes advantage of the even-aged arrangement of many natural stands, and regulates the harvest by striving to achieve a "balanced" forest wherein an equal area can be harvested every year in perpetuity.

Harvest Cutting Methods in Even-Aged Management

There are several ways to achieve regeneration or reproduction of forest stands under even-aged management:

Clearcutting harvests all designated merchantable trees to clear the way for the establishment of a new even-aged stand of seedlings. Some trees are designated to remain on site to help achieve a Desired Future Condition, or are unmerchantable and do not hinder the establishment and growth of the new stand.

The new stand could be started by natural or artificial seeding, planting of seedlings, or sprouting from stumps or roots of cut trees. On the Mt. Hood National Forest most stands are regenerated by planting because it is the most reliable way to get seedlings quickly established.

The shelterwood method is also an even-aged method, but involves removal of the parent stand in a series of two or more harvests. Part of the parent stand is retained to provide "shelter" for planted seedlings--and sometimes seed for natural regeneration--to help get the new stand established. This method is often useful where environmental conditions are too severe for seedlings to become established under the clearcut method. Eventually, the remaining part of the parent stand (except trees reserved to achieve a Desired Future Condition) is also harvested in a "final removal" cut. For a period of a few years, usually less than ten, there may be two age classes present--one from the original stand and one from the new stand.

The seed tree method leaves a few trees at the time of harvest to produce seed for natural regeneration. It differs from the shelterwood method in that the few trees left do not materially shelter the seedling environment. The seed trees may be removed when the new stand has been established, or may be retained indefinitely for various reasons.

Intermediate Cuttings in Even-Aged Management

Intermediate cuttings, called commercial thinnings, may occur at intervals throughout the life of an even-aged stand. The objective of commercial thinning is to harvest trees that would otherwise be lost to mortality, and reallocate sunlight, water, and nutrients to the remaining trees. Commercial thinnings help to secure income from a stand before it is old enough to harvest with a regeneration cut.

The number of thinnings and the amount removed at each is dependent on the productivity of the site, management objectives, and economic factors that make it worthwhile. The first thinning may occur as soon as enough trees in the stand are large enough to provide a merchantable product, but many thinnings are delayed until the smaller-than-average trees are merchantable. In this way, poor performers are harvested first, and the best trees remain to continue growing. Two, three, and even more thinnings can be scheduled when the trees begin again to compete for moisture and nutrients to the point where some of them might die out.

Usually it is desireable to keep the stand dense enough to maximize stand growth, but not so dense competition for light, water and nutrients could cause mortality or retarded growth. Theoretically, very light thinnings could be made every year. Usually it is more practical to cut a little heavier and wait longer before reentering the stand for the next thinning.

Commercial thinnings are differentiated from the series of harvests needed for uneven-aged management, in that they do not materially affect the average age of the stand, do not initiate regeneration, and do not change the ultimate plan to complete a regeneration harvest cut at the end of the rotation.

Uneven-Aged Management

Uneven-aged management usually involves many harvest entries, each of which removes some older trees in the stand and sets the stage for a little regeneration to occur. If the stand has a classic uneven-aged structure, most of the removal would come only from older age classes. Since it is very difficult to achieve uniform balance and there is often a surplus in one or more age classes, some cutting in all age classes is usually necessary.

Even though uneven-aged management involves many harvest entries, each entry is entirely different in both approach and appearance from the commercial thinnings described above for even-aged management. Even-aged commercial thinnings harvest trees from the only age class present in the stand, while uneven-aged entries harvest trees from one or more of many age classes. Or, if the objective is to convert a stand from an even-aged structure to an uneven-aged one, enough trees would be removed to stimulate regeneration which would then become a new age class. After many repetitions, the stand would eventually become uneven-aged.

Harvest Cutting Methods in Uneven-Aged Management

In the single-tree selection method of uneven-aged management, scattered individual mature trees are harvested. Cutting is repeated at relatively frequent intervals, but only a few trees are removed each time. Regeneration of seedlings normally occurs in the spaces created by the removal of the harvested trees.

The group-selection method is similar except small groups of trees instead of scattered individuals are removed at each entry. Openings created may vary from the width of a few tree crowns up to an acre or two. The largest openings in this method may resemble small clearcuts, but when the openings are larger than about two acres, the management philosophy more closely resembles even-aged management. Carefully executed, the group-selection method results in a mosaic of very small even-aged groups or aggregations.

Intermediate Cutting in Uneven-Aged Management

An improvement cutting removes the less valuable or undesirable trees from an uneven-aged stand without any attempt to foster regeneration.

How Management Activities Affect Vegetation

The following is a general description of management activities and the major effects they can have on vegetation.

Cutting Vegetation

This type of activity includes cutting and removing or rearranging trees, shrubs, and other vegetation for a variety of reasons, mostly for production of wood products and for wildlife habitat management Vegetation is also removed to manage population levels of insects and diseases which affect valuable plant species, to provide other forest products to the public, to reduce fire hazard, to enhance views and aesthetics of special places, and to maintain a safe environment in designated recreation and work areas, and in transportation corridors. In addition, vegetation is removed or recycled as food by wild and domestic animals, and manipulated to provide dead and down habitat. The extent, location, timing, and prescription for the vegetation cutting and/or removal determines the overall scope of the effects, but the general effects for each piece of ground treated do not vary among the alternatives.

Cutting vegetation:

- alters successional patterns; degree of change is affected by kind and amount of vegetation cut, and by plant association where it occurs;
- changes species composition of the cutover area and of the basin in which the cutting occurs;
- encourages production of annual forbs, grasses, and other species which are prolific seed producers;
- changes age distribution of the vegetation in the cutover area and in the basins in which cutting occurs;
- changes amount and arrangement of organic debris such as logs, branches, and twigs;

- kills roots, temporarily reducing resistance to landslides on unstable slopes;
- changes the amount of ground water -- usually increasing it, but decreasing the amount in localities where fog-drip is a significant part of total precipitation.
- changes habitats in the cutover area, and changes the distribution of these habitats in the basins in which the cutting occurs;
- along streams, changes the type and timing of organic debris deposits in stream systems;
- along streams, may increase water temperature if the cutting allows more sunlight to reach the water surface;
- influences dependence of communities on timber revenues;
- .increases growth rates of remaining vegetation, encourages resprouting of lower vegetation mainly shrub species like vine maple, huckleberry, rhododendron, and salal;
- may alter microclimate by increasing daily temperature fluctuations and increasing surface winds;
- changes visual characteristics;
- eliminates the natural condition of areas not previously cut.

Burning Vegetation and Organic Debris:

Vegetation and debris is sometimes disposed of by prescribed fire. The objectives are to:

- reduce the severity of wildfire by reducing fuel;
- reduce undesirable competing vegetation to increase sunlight and nutrients for desired trees or forage;
- encourage desirable forage plants through sprouting;
- facilitate tree planting by reducing low-growing vegetation and logging slash.

Burning:

- alters successional patterns;
- alters the soil by changing the amount and availability of nutrients in the organic layer (especially nitrogen), reduces the soil's resistance to erosion, and lowers reservoirs of soil microorganisms and mycorrhizal fungi;
- changes visual characteristics;
- reduces the risk of wildfire and the difficulty of suppressing wildfire;
- creates smoke in local airsheds, and sometimes in remote airsheds;
- alters the microclimate by increasing surface temperatures as long as black or unvegetated surfaces remain;
- causes sprouting of some species.

Mechanical Site Preparation

Mechanical Site Preparation redistributes vegetation and slash with machinery. The objectives are similar to those of burning, described above.

Mechanical Site Preparation:

- increases survival of desired vegetation by displacing vegetation that would compete with it;
- alters the soil by displacing sources of nutrients in the vegetation and slash;
- alters the soil by compressing tiny pores that are important for aeration and holding water;
- exposes mineral soil to raindrop impact and surface runoff;
- alters visual characteristics;
- reduces the risk of wildfire and the difficulty of suppressing wildfire;
- creates smoke if piles are burned;
- alters successional patterns.

Use of Forestry Chemicals

Forestry chemicals such as fertilizer, pesticides, herbicides, and other materials are sometimes applied to vegetation in order to change it. The objective is usually to improve growth or selectively reduce plants or animals which compete with or damage desired Forest resources.

Forestry chemicals:

- may increase growth of desired species and other species;
- may increase survival of desired species;
- may kill or damage some species more than others; usually unwanted species are affected most, but desired species are sometimes unintentionally affected.
- With inappropriate application or accidental spill:
- may contaminate water downstream;

- may damage or kill plants or animals outside target area.

Planting Vegetation

Planting introduces or replaces desired vegetation into areas where it has been cut or burned. The objective is to enhance economic, ecological, or aesthetic values.

Planting:

- alters species composition and distribution;
- alters visual characteristics;
- increases soil strength and resistance to erosion by promoting root growth and ground cover;
- may change forage and habitat for some wildlife;
- initiates future timber crops;
- alters successional patterns.

Environmental Effects of the Alternatives on Vegetation

Overview of Direct and Indirect Effects

All alternatives would have direct effects on vegetation. Direct effects on vegetation include changes in species composition and distribution, age classes, growth rates, risks of windthrow, susceptibility to pests, and fire. The range, timing, and location of effects would vary by alternative.

Effects on Diversity of Vegetation (Also see discussion of Plant and Animal Communities in the Wildlife component of this chapter).

Species Diversity. In theory, natural species diversity of the tree layer could be maintained by reforesting with the same species existing before harvest. The practice is to plant species with the best prospects for survival and future value. Other species seed in from natural sources. Prescriptions foster species needed for our management objectives, including species diversity, in stocking level control treatments.

Natural processes are biological responses to seasonal cycles and random or irregular events in a dynamic environment. For a comprehensive treatment of how the various plant communities respond, refer to the Plant Association and Management Guidelines for the various vegetation zones. Some events, such as windthrow, can perpetuate dense stands of climax species. When this happens, only a few plants of the most shade tolerant kind can survive, and the eventual result is a narrow range of understory vegetation. Wildfire can lead to both complex and simple communities. If the fire is intense and many species are killed, the resulting community may be a narrow one. A less intense fire could well lead to a very diverse community, trees, forbs, grasses and shrubs, that process through predictable successional patterns. The same is true of the effects of prescribed fire at different levels of intensity.

Vegetation in Management Areas devoted to nonconsumptive use would be most affected by natural processes. Successional history and age of the vegetation on these lands controls the amount of diversity.

Repeated disturbances reduce ecosystem complexity by interrupting succession. Vegetation in Management Areas where timber harvest is allowed would be disturbed more often. These lands would be occupied by early seral plant communities dominated by forbes and shrubs and populated by animals that require open-structured habitat. Depending on the harvest rate planned in a Management Area, many original attributes would be regained before the stand is harvested again. Some common plants in disturbed areas are: fireweed, beargrass, huckleberry, rhododendron, and snowbrush.

Standards and Guidelines are used to reduce the risk of narrowing the vegetation community from application of management activities. While based on the best scientific and professional knowledge available, some practices included in the Standards and Guidelines are untried, and it is not known how well they will work. The Forest Plan includes a monitoring strategy to measure the effectiveness of the *Standards and Guidelines* and direction on how to make adjustments and modifications in activities where needed.

All alternatives provide a great storehouse of natural variety on forest land where timber harvest is not allowed. On some borders of the Forest, other owners have harvested much of their timber and continue to manage primarily for consumptive uses. National Forest lands can help offset effects of loss of diversity in such cases.

The greatest compositional diversity is probably maintained in very young and very old communities. The mixture provide a balance of change and stability and patterns of consumptive and nonconsumptive use of the forest vegetation over the long run. The amount of land allocated to the two broad categories of use provides one indication of the relative ability of the alternatives to maintain diversity.

Trees and Woody Plants

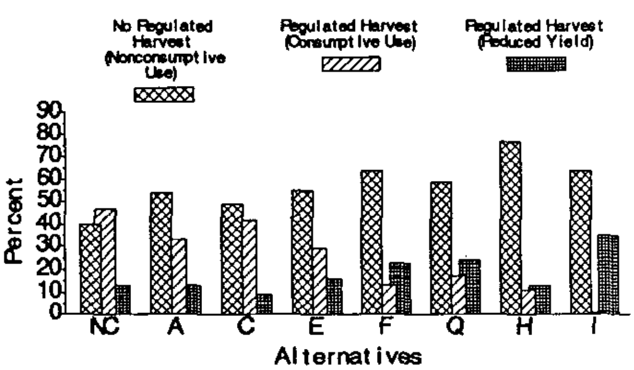
Silvicultural practices, described in detail in Appendix I, affect the range of tree species in managed stands. Most planted trees would be Douglas-fir and noble fir, but Standards and Guidelines allow other native tree species in all working groups. Alder and other hardwoods

Table IV -9 Intensity of Use of Vegetation by Alternative
(Percent)

Use of Vegetation	Alternative							
	NC	A	C	E	F	H	I	Q (Preferred)
Passive (Nonconsumptive)	40	54	49	55	64	77	64	59
Consumption Based on full yield	47	33	42	29	13	11	1	17
Reduced Consumption	13	13	9	16	23	13	35	24

which are immune to laminated root rot, and some resistant pines, may be planted in root-rot infection centers. Lodgepole pine may be planted in areas with severe frost or drought conditions. All commercial species would be encouraged in silvicultural treatments such as precommercial and commercial thinning, and release. No species would be eliminated in any alternative.

Figure IV-10 Management Intensity of Vegetation Percent of Forested Area



Genetic Diversity. The amount of variation in the gene pool affects the ability of species to react to major changes in the environment. The Tree Improvement Program includes examples of the best-performing genotypes and excludes poor performers from the reforestation program, resulting in a minor loss of genetic diversity.

The Tree Improvement Program would not vary by alternative, but the acreage to which it is applied varies in proportion to the acreage planted under each alternative. One of the three main goals of the Tree Improvement Program is to maintain the genetic diversity of forest stands. Seed tree selection, stand improvement, and other genetic practices are designed with this goal in mind.

The Tree Improvement Program cultivates a broad array of native conifer species. Natural regeneration and advanced regeneration also contribute to the species and genetic diversity of shrubs and trees.

Age diversity. How often timber crops are harvested and replaced with and begin new ones -- called rotation -- affects age diversity. The rotation length controls the vegetation age classes and understory responses to canopy density.

Figure IV-11 Rotations Lengths

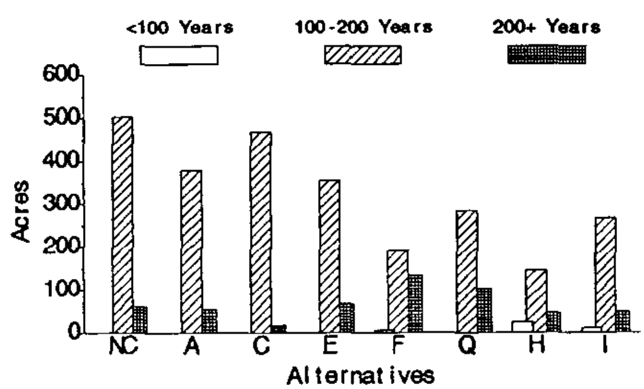


Table IV-10 Weighted Average Rotation Length (Years)

Management Areas	Alternative							
	NC	A	C	E	F	H	I	Q (Preferred)
B	232	222	188	223	240	221	178	228
C	125	126	125	125	122	112	74	124
Forest Average	149	153	133	178	197	170	174	185

Species composition of the plant community may approach natural patterns in very long rotations. Effects on diversity of animal species may be greater than on plant species.

Wood quality and value, resulting from size and frequency of knots, tightness of wood grain, and average log size, are affected by rotation length and silvicultural practices such as stocking level control. Alternatives with more area managed on long rotations would produce timber of higher quality and value. These differences will become more important as lands under other ownership are managed in shorter rotations.

The age groups below show how differences in rotation length would affect the size of the tree layer. Forb openings and sites with young trees less than 20 years old; immature trees, 30 to 110 years old; mature trees 120 to 170 years old; and forest with predominantly old-growth attributes (170 years and older). Percent of vegetated land in each age group at the end of the first, second, and fifth decades are shown in Table IV-12.

Older trees are usually larger trees. Diameter growth generally follows changes in age groups, as shown in Table IV-11 on page 57.

Plant Associations. Plant associations would not vary by alternative because they indicate potential, not actual, vegetation. Relative proportion of age classes, and where they exist, would differ. Successional stage of the plant community would be linked to age class.

Effects on Yew. Where yew occurs in harvest areas, it would be damaged by logging. Yew survives, but does not necessarily thrive in cut over areas and is killed by fire.

Growth Rates

Fertilization affects health, vigor, and growth of vegetation through introduction of nutrients that are in short supply. It is usually applied to forest stands to increase the growth rate of trees. Properly applied, the result can be larger trees in the same length of time or the same size trees in a shorter time. Fertilization could actually reduce merchantable stand growth by increasing growth of individual trees at the expense of merchantable trees unable to compete in stands that are too dense. Stocking level control would reduce this possibility.

Fertilizer would be applied to managed stands where Douglas-fir is the primary species, and occasionally on other valuable species. Fertilizer treatments would normally be applied to stands when a positive economic response is projected. Alternatives with more harvest and more area managed for timber purposes would have more growth effects from fertilization.

All alternatives would also provide fertilization for wildlife habitat enhancement. Trees would also benefit from this treatment.

The growth rate of individual trees is responsive to stand density. Properly spaced stands have more growth on trees that meet specifications for lumber and wood products, but dense stands may have more total biomass production. Precommercial thinning, cleaning and weeding, and commercial thinning affects density of stands. Therefore, alternatives with the most area in intensive management have more economically valuable growth. Alternatives with less area in intensive management would have potentially more total biomass production.

Threatened, Endangered and Sensitive Plants - refer to the Sensitive Plants Environmental Component of this chapter.

Windthrow, Pests, and Fire

The amount of windthrow is a function of the amount of exposed edge. Effects of the alternatives on risk of windthrow are related to the number and size of openings created, and the size and windfirmness of adjacent stands. Increased harvest and roads would increase the chance of windthrow for a while. Eventually, because managed stands are potentially more windfirm than old growth, windthrow would be reduced. Reducing fragmentation of old-growth stands by managing timber in

Table IV-11 Forest Stand Characteristics by Age Class

Age Range	Diameter Range Western Hemlock Zone	Diameter Range Pacific Silver Fir Zone	Understory Vegetation
<=10 years	Seedlings and Saplings	Seedlings and Saplings	early successional grasses, forbs, and shrubs; small amounts of conifers and late successional understory from previous undisturbed forest
10-29 years	<9" dbh	<6" dbh	conifers becoming dominant; early successsional grasses, forbs and shurbs beginning to decline
30-69 years	8-16" dbh	6-14" dbh	conifers dominant; understory poor or impoverished; understory includes traces of late successional plants from previous undisturbed forest
70-119 years	14-24" dbh	12-20" dbh	conifers dominant; pioneers absent; full complement of late successional species, amounts dependent on canopy density
120-169 years	18-32" dbh	16-24" dbh	more shade tolerant conifers;
170 + years	24-40" dbh	20-28+" dbh	shade tolerant conifers developing;

larger blocks instead of dispersed smaller units would reduce windthrow by reducing the amount of exposed edge per unit of area. Minimum fragmentation is to be considered in project planning.

The risk of pest outbreak, particularly insect pests, may be higher in areas where forests are allowed to get too dense, and where exceptionally large amounts of damaged, dead, and down trees remain. Managed stands are kept at lower density than natural ones, so trees are generally more vigorous, less stressed, and less vulnerable to effects of insects and disease. Alternatives with more lands dedicated to timber production would also be more accessible. Increased access offers more opportunity for detection and timely treatment.

As more of the Forest is exposed to human activities, risk of wildfire increases. Escaped slash fires and fires resulting from timber harvest operations are of greatest concern. Such fires usually start in areas of heavy fuel concentrations and tend to be much larger than fires of natural origin.

Riparian Vegetation (Also refer to the Aquatic Resources and Water Environmental Components of this chapter)

Riparian vegetation is very important to the diversity and stability of forest ecosystems.

In riparian corridors along streams, rivers, and lakes, the presence of many vegetative layers provides a variety of nesting, cover, and food sources for wildlife. Roots of riparian vegetation help to stabilize streambanks and adjacent slopes. Vegetation shades the stream surface to maintain water temperatures needed for fish and other aquatic creatures. Woody material in the stream channels helps to build and maintain spawning and rearing habitat. People, wildlife, and plant life prefer the cooler, more humid, and breezy conditions in the summer.

All alternatives would meet Standards and Guidelines for riparian areas. It would be more difficult to ensure the effectiveness of these Guidelines in alternatives with higher harvest rates. The degree to which they are effective would be reflected in stream channel stability and water quality. In the long term, alternatives with more harvest would provide less large woody material for aquatic nutrient cycling, and spawning gravel catchment. For more information on effects on riparian vegetation, see the section on Aquatic Resources in this Chapter.

Existing meadows would be maintained in all alternatives.

**Table IV-12 Predicted Change in Vegetation
Percent of Forest Area**

Age Group	Alternative							
	NC	A	C	E	F	H	I	Q (Preferred)
Existing								
0*	0	0	0	0	0	0	0	0
10-29	8	8	8	8	8	8	8	8
30-69	7	7	7	7	7	7	7	7
70-119	22	22	22	22	22	22	22	22
120-169	26	26	26	26	26	26	26	26
170 +	37	37	37	37	37	37	37	37
Decade 1								
0	5	4	4	5	2	2	3	3
10-29	8	8	8	8	8	8	8	8
30-69	7	7	7	7	7	7	7	7
70-119	21	21	21	21	21	21	21	21
120-169	26	26	27	26	27	27	26	26
170 +	33	34	33	33	35	35	35	35
Decade 2								
0	4	3	4	4	2	2	2	3
10-29	9	8	9	10	7	6	7	8
30-69	9	9	9	9	9	9	9	9
70-119	13	13	12	12	13	13	13	12
120-169	29	29	29	26	29	28	29	28
170 +	36	38	37	29	40	42	40	40
Decade 5								
0	4	3	4	3	2	2	2	3
10-29	8	7	7	6	4	3	5	6
30-69	17	15	17	17	13	12	13	14
70-119	7	7	7	7	7	7	7	7
120-169	21	21	20	21	21	21	19	19
170 +	43	47	45	46	53	56	53	51

* *Existing cutover areas and plantations are included in the 10-20 year age group.*

Overview of Cumulative Effects

Use and harvest of vegetation, and its replacement, changes the vegetation mosaic. This affects ecological relationships between species and their environment. Relationships changed are:

- rates of soil nitrogen fixation (from alder and other nitrogen fixing plants), which alters plant growth;
- resistance to root rot and other diseases specific to certain species or age of trees;
- interactions with species that can easily relocate or adapt to different conditions;
- interactions with species that are limited to a narrow range of habitat conditions.

The immediate magnitude of these effects is indicated by the total acreage harvested and planted on Forest lands. Accumulation of effects is controlled both by rates of consumption and rates of replenishment and growth.

Effects by Alternative

Alternative NC

Alternative NC continues current vegetation management. Under this alternative about 40 percent of the forested area would be devoted to nonconsumptive use. ASQ and other planned consumption of Forest vegetation resources would be based on full yield from 47 percent of the forested area. Reduced harvest rates are assigned to 13 percent of the forested area.

Direct and Indirect Effects

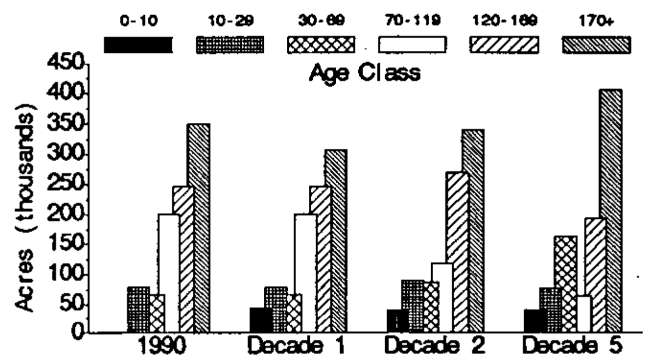
This alternative does not use the newest assessment of land suitability, so it does not fully reflect NFMA's criteria. The LTSYC and ASQ are based on some land now considered unsuitable for timber management.

Because harvest would tend to be considered on some lands now considered unsuitable because of regeneration difficulty, tree stocking would not always be replaced to previous levels after harvest. Aggressive pioneer species would occupy many of these sites for a long time after harvest, but trees would eventually return.

Lands now rated unsuitable on the basis of their geomorphologic properties would tend to be considered in timber sale planning more often, and would depend on Forest-wide standards to prevent damage. If cutover, unstable lands would eventually lose the benefit of large tree root strength. Until restabilized by eventual growth of new tree roots, these lands would tend to slide or erode, exposing bare soil to pioneer species of vegetation with little ability to prevent further erosion.

Trends in the distribution of the vegetation mosaic would be toward the younger age-classes on lands where timber harvest is allowed, but toward the older age classes on other lands. Except near major rivers and reserved areas, patterns would be evenly-distributed. The area of each age class would be comparable to the others in the long run.

Figure IV-12 Alternative NC--Vegetation Trends by Vegetation Age Group



Cutover areas would have about the same amount of diversity as that exhibited by areas harvested between 1960 and 1980, with the addition of snags and green tree replacements in cutting prescriptions. Hemlocks and true firs would increase relative to areas cut between 1960 and 1980.

Cumulative Effects

On a human time scale, old growth cannot be replaced. This alternative provides old growth and all its attendant values in Wilderness, roadless areas, and special interest areas.

We do not know all of the properties of old growth. Options for study and exploration of other uses for old growth would eventually be restricted to the reserved areas. Some old growth values and potential for study would persist in over 160,000 acres included in scenic viewsheds where harvest rates are reduced. Refer to the section on old growth in this chapter for more discussion.

As shown in figure IV-12, the area of communities featuring grasses, forbs, shrubs, and conifer seedlings would remain relatively constant through the fifth decade. The vegetation age-group in which conifers begin to dominate grasses, forbs, and shrubs (age 10 through 29) increases slightly by decade 2, then decreases to near current level by decade 5. Young fast-growing conifers with an impoverished understory (age 30 through 69), increase in area by decade two, and almost double the area by decade 5.

A steady decline marks the trend of age class 70 through 119, so that by decade 5 the amount is comparable to the first two vegetative groups. This vegetation community lacks pioneer species, but late successional understory species are present. Shade tolerant understory conifers become more prevalent in the age group 120 through 169. The area of this group increases through decade 2, then drops by decade 5. The age group of 170 years and older often, but not always, includes most old-growth attributes. This age group declines in the first decade as a result of harvest, but increases substantially thereafter through decade 5. Stands moving up in age faster than the harvest rate are the reason for this steady increase.

Alternative A

Alternative A is similar to Alternative NC, except that Management Requirements (MRs) are added for wildlife, and soil and water resources.

Also, this alternative makes use of the latest timber suitability assessment.

Under this alternative about 54 percent of the forested area would be devoted to nonconsumptive use of vegetation. ASQ and other planned consumption of Forest vegetation resources would be based on full yield from 33 percent of the forested area, but 13 percent of the forested area would be assigned reduced harvest rates.

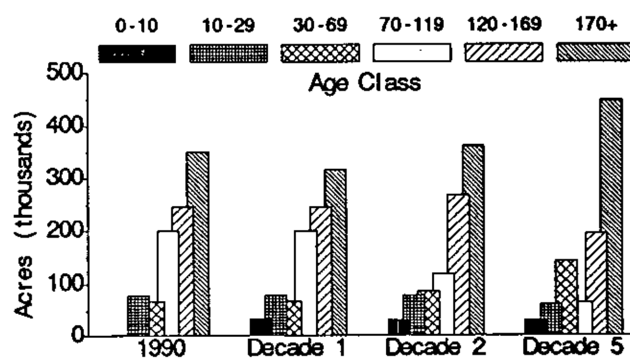
Direct and Indirect Effects

Standards for vegetation management practices would be met by this alternative, because it uses the latest information about land suitability for timber management. Stocking levels on cutover land would be returned to minimum or prescribed levels within five years.

This alternative includes Management Requirements (MRs). The MRs are parcels of land set aside to meet minimum habitat requirements for pileated wood peckers, pine marten, and northern spotted owls. Many MRs are isolated from each other by land that will eventually become cutover. Effectiveness of the MRs may sometimes be eroded by windthrow because they tend to have a lot of exposed edge. Standards for retention of large woody material would result in relatively high fuel levels.

The vegetation mosaic under alternative A would be similar to that under alternative NC, except stands set aside under the MRs. Younger age-classes would eventually predominate on lands where timber harvest is allowed, but trends are toward the older age classes on other lands.

Figure IV-13 Alternative A--Vegetation Trends by Vegetation Age Group



Cutover areas would have about the same amount of diversity as that exhibited by areas harvested between 1960 and 1980, with the addition of snags and green tree replacements in cutting prescriptions. There would be more hemlocks and true firs in newer plantations than there are in areas cut between 1960 and 1980.

Cumulative Effects

On a human time scale, old growth cannot be replaced. This alternative provides old growth and all its attendant values in Wilderness, roadless areas, special interest areas, and adds Minimum Management Requirements (MRs). We do not know all of the properties of old growth; therefore, options for study and exploration of other uses for old growth would eventually be restricted to the reserved areas. Refer to the section on old growth in this chapter for further discussion.

As shown in figure IV-13, the area of communities featuring grasses, forbs, shrubs, and conifer seedlings would remain relatively constant through decade 5. The vegetation age-group in which conifers begin to dominate grasses, forbs, and shrubs (age 10 through 29) remains steady through decade 2, then decreases below current level by decade 5. The area of young fast-growing conifers (age 30 through 69), with its impoverished understory, increases by decade two, and increases markedly by decade 5.

A steady decline marks the trend of age class 70 through 119, so that by decade 5 the amount is comparable to the first two vegetative groups. This vegetation community has late successional understory species, lacks pioneer species. Shade tolerant understory conifers become more prevalent in the age group 120 through 169. The area of this group increases through decade 2, then drops by decade 5. The age group of 170 years and older often, but not always, includes most old-growth attributes. This age group declines in the first decade as a result of harvest, but increases substantially thereafter through decade 5. Stands moving up in age faster than the harvest rate are the reason for this steady increase.

Alternative C

Alternative C devotes all suitable land to timber harvest in an attempt to meet RPA (Resources Planning Act) and Forestry Program For Oregon (FPFO) objectives.

Under this alternative about 49 percent of the forested area would be devoted to nonconsumptive use. ASQ and other planned consumption of Forest vegetation resources would be based on full yield from 42 percent of the forested area. Reduced harvest rates would be assigned to 9 percent of the forested area.

Direct and Indirect Effects

Standards for vegetation management practices would be met by this alternative, because it uses the latest information about land suitability for timber management. Stocking levels on cutover land would be returned to minimum or prescribed levels within five years.

This alternative includes MRs. The MRs are parcels of land set aside to meet minimum habitat requirements for pileated wood peckers, pine marten, and northern spotted owls. The MRs are usually isolated from each other by land that will eventually become cutover. Effectiveness of the MRs may sometimes be eroded by windthrow because they tend to have a lot of exposed edge. Standards for retention of large woody material would result in relatively high fuel levels.

The vegetation mosaic under alternative C would be similar to that under alternative NC, except stands set aside under the MRs.

Figure IV-14 Alternative C-- Vegetation Trends by Vegetation Age Group

Cut-over patterns would be extended into the Bull Run watershed.

Cutover areas would have about the same amount of diversity as that exhibited by areas harvested between 1960 and 1980, with the addition of snags and green tree replacements in cutting prescriptions. Hemlocks and true firs would increase in newer cutover areas.

Cumulative Effects

Old growth, once harvested, cannot be replaced. This alternative provides old growth and all its attendant values in Wilderness, roadless areas, Minimum Management Requirements (MRs), and special interest areas. We do not know all of the properties of old growth; therefore, options for study and exploration of other uses for old growth would eventually be restricted to the reserved areas. Refer to the section on old growth in the chapter for further discussion.

Figure IV-14 shows that the area of communities featuring grasses, forbs, shrubs, and conifer seedlings would remain relatively constant through decade 5. The vegetation age-group in which conifers begin to dominate grasses, forbs, and shrubs (age 10 through 29) remains steady through decade 2, then decreases below current level by decade 5. The area of young fast-growing conifers (age 30 through 69), increases by decade two, and almost doubles by decade 5. Little understory diversity is afforded in this class.

A steep decline through decade 2 marks the trend of age class 70 through 119, so that by decade 5 the amount is comparable to the first two vegetation groups. This vegetation community species lacks pioneer species, but late successional understory are present. Shade tolerant understory conifers become more prevalent in the age group 120 through 169. The area of this group increases through decade 2, then drops by decade 5. The age group of 170 years and older often, but not always, includes most old-growth attributes. This age group declines in the first decade as a result of harvest, but increases substantially thereafter through decade 5. Stands moving up in age faster than the harvest rate are the reason for this steady increase.

Alternative E

This alternative was the Forest's preferred alternative for the DEIS. It is the only final alternative calling for departure from non-declining even-flow.

Under this alternative about 55 percent of the forested area would be devoted to nonconsumptive use of vegetation. ASQ and other planned consumption of Forest vegetation resources would be based on full yield from 29 percent of the forested area, and reduced harvest rates would be assigned to 16 percent of the forested area.

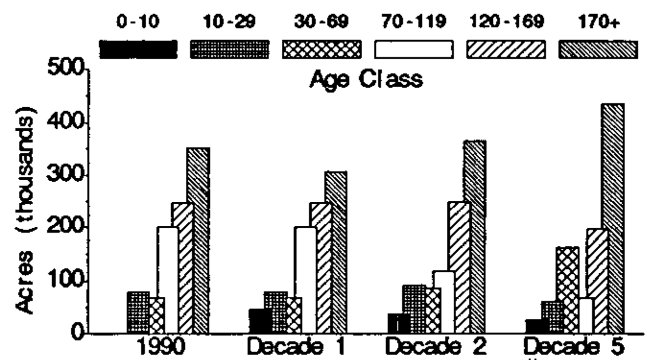
Direct and Indirect Effects

Standards for vegetation management practices would be met by this alternative, because it uses the latest information about land suitability for timber management. Stocking levels on cutover land would be returned to minimum or prescribed levels within five years.

This alternative includes Management Requirements (MRs). The MRs are parcels of land set aside to meet minimum habitat requirements for pileated wood peckers, pine marten, and northern spotted owls. The MRs are usually isolated from each other by land that will eventually become cutover. Effectiveness of the MRs may sometimes be eroded by windthrow because they tend to have a lot of exposed edge. Standards for retention of large woody material would result in relatively high fuel levels.

The vegetation mosaic under alternative E would be patterned similar to alternative NC but with much broader concentrations of the older age classes near major rivers, and in the MRs. Outside the MRs and well away from major rivers in the upper elevations, the vegetation mosaic would shift toward younger age-classes. In areas of dominant timber use patterns would be evenly-distributed, and the area of each age class would be comparable to the others.

Figure IV-15 Alternative E--Vegetation Trends by Vegetation Age Group



Timber harvest would be an important tool for achieving other resource objectives.

Cutover areas would have about the same amount of diversity as that exhibited by areas harvested between 1960 and 1980, with the addition of snags and green tree replacements in cutting prescriptions. Hemlocks and true firs would be more common in newer plantations.

Cumulative Effects

This alternative provides old growth and all its attendant values in Wilderness, roadless areas, Management Requirements (MRs), visually sensitive areas, and special interest areas. Refer to the section on old growth in this chapter for further discussion.

As shown in figure IV-15 the area of communities featuring grasses, forbs, shrubs, and conifer seedlings would slowly diminish through decade 5. The vegetation age-group in which conifers begin to dominate grasses, forbs, and shrubs (age 10 through 29) increases by decade 2, then decreases to near current level by decade 5. The age group of young fast-growing conifers (age 30 through 69),including its impoverished understory, increases by decade two, and almost doubles by decade by decade 5.

A steady decline marks the trend of age class 70 through 119, so that by decade 5 the amount is comparable to the first two vegetation groups. This vegetation community species lacks pioneer species, but late successional understory are present. Shade tolerant understory conifers become more prevalent in the age group 120 through 169. The area of this group stays steady through decade 2, then drops by decade 5. The age group of 170 years and older often, but not always, includes most old-growth attributes. This age group declines in the first decade as a result of harvest, but increases substantially thereafter through decade 5. Stands moving up in age faster than the harvest rate are the reason for this steady increase.

By the fifth decade, this alternative provides old growth on only about one sixth of the forest lands subject to timber harvest. This loss is contrasted to increasing amounts of diversity in the pioneer and early seral species groups.

Alternative F

Under this alternative about 64 percent of the forested area would be devoted to nonconsumptive use of vegetation. ASQ and other planned consumption of Forest vegetation resources would be based on full yield from 13 percent of the forested area, and 23 percent of the forested area would be assigned a reduced harvest rate.

Direct and Indirect Effects

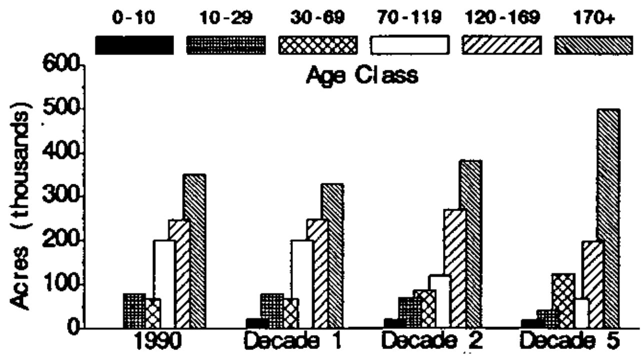
Standards for vegetation management practices would be met by this alternative, because it uses the latest information about land suitability for timber management. Stocking levels on cutover land would be returned to minimum or prescribed levels within five years.

This alternative includes Management Requirements (MRs). The MRs are parcels of land set aside to meet minimum habitat requirements for pileated wood peckers, pine marten, and northern spotted owls. The MRs are usually isolated from each other by land that will eventually become cutover. Effectiveness of the MRs may sometimes be eroded by windthrow because they tend to have a lot of exposed edge, but in alternative F the integrity of MRs would be increased. Standards for retention of large woody material would result in relatively high fuel levels.

The vegetation mosaic under alternative F would have older stands concentrated in sensitive viewsheds. Outside the viewsheds, MRs, and other reserved areas, the vegetation mosaic would be composed mostly of the younger age-classes. Patterns outside viewsheds would be evenly-distributed, and the area of each age class would be comparable to the others.

Cutover areas would have about the same amount of diversity as that exhibited by areas harvested between 1960 and 1980, with the addition of snags and green tree replacements in cutting prescriptions. Hemlocks and true firs would be more common in newer plantations.

Figure IV-16 Alternative F--Vegetation Trends by Vegetation Age Group



Cumulative Effects

This alternative reduces the amount of old growth and all its attendant values to reservations in Wilderness, roadless areas, Management Requirements (MRs), and special interest areas. Some old growth would remain in visually sensitive areas.

As shown in figure IV-16 plant communities dominated by grasses, forbs, shrubs, and conifer seedlings would remain relatively constant through decade 5. The vegetation age-group in which conifers begin to dominate grasses,forbs, and shrubs (age 10 through 29) decreases slightly by decade 2, then drops below current level by decade 5. The age group of young fast-growing conifers (age 30 through 69)has an impoverished understory. The area of this group increases steadily through decade 5.

The trend of age class 70 through 119 is a steady decline, but by decade 5 the amount is still greater than the first two vegetation groups. Late successional species replace pioneer species in this age group. Shade tolerant understory conifers become more prevalent in the age group 120 through 169. The area of this group increases through decade 2, then drops by decade 5. Often, but not always, the age group of 170 years and older includes most old-growth attributes. The area of this group declines in the first decade as a result of harvest, but increases substantially thereafter through decade 5. Stands moving up in age faster than the harvest rate are the reason for this steady increase.

Alternative H

Under this alternative about 77 percent of the forested area would be devoted to nonconsumptive use of vegetation. ASQ and other planned consumption of Forest vegetation resources would be based on full yield from 11 percent of the forested area, but reduced harvest rates would be assigned to 13 percent of the forested area.

Direct and Indirect Effects

Standards for vegetation management practices would be met by this alternative, because it uses the latest information about land suitability for timber management. Stocking levels on cutover land would be returned to minimum or prescribed levels within five years.

This alternative includes Management Requirements (MRs) and emphasizes retention of old growth. The MRs are parcels of land set aside to meet minimum habitat requirements for pileated wood peckers, pine marten, and northern spotted owls. Isolation of MRs would be greatly reduced, and vegetation mosaics would be more continuous. Effectiveness of the MRs would be secure because edges exposed to windthrow would be greatly reduced, and harvest activities would be paced to provide protection from adjacent managed stands. Retention of large woody material would result in relatively high continuous fuel levels.

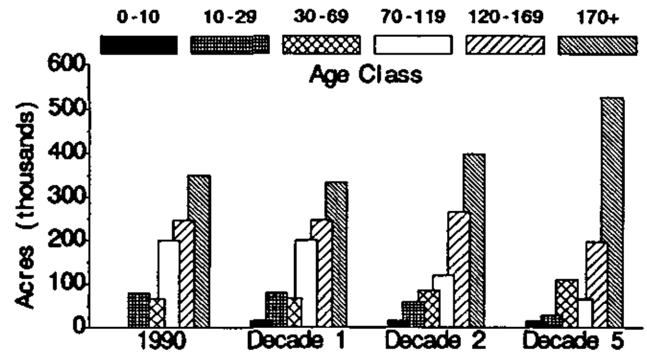
The vegetation mosaic under alternative H would emphasize remaining old growth. In areas where timber management has been practiced in the past, the vegetation mosaic would be composed mostly of the younger age-classes. Patterns would be reflect the historical use of the Forest. More area would have an uneven-aged structure.

Cutover areas would have much more diversity than that exhibited by areas harvested between 1960 and 1980. Hemlocks and true firs would increase relative to areas cut between 1960 and 1980. Control of forest diseases and insect problems would be minimal.

Cumulative Effects

This alternative provides more old growth and attendant values by adding substantially to acreage devoted to nonconsumptive uses. Old growth is also protected by reservations in Wilderness, roadless areas, Management Requirements (MRs), and special interest areas.

Figure IV-17 Alternative H–Vegetation Trends by Vegetation Age Group



Options for study and exploration of nonconsumptive uses for old growth would be greatest under this alternative. The area forest with predominantly old-growth attributes (older than 170 years) would increase nearly 178,000 acres to about 56% of the forested area by decade 5 of the Plan, more total old-growth than any other alternative.

As shown in figure IV-17, the area of communities featuring grasses, forbs, shrubs, and conifer seedlings would remain relatively constant through decade 5, but at the lowest level of any alternative because of low harvest levels. The vegetation age-group in which conifers begin to dominate grasses,forbs, and shrubs (age 10 through 29) increases slightly by decade 2, then decreases below current level by decade 5. The age group of young fast-growing conifers (age 30 through 69) which create an impoverished understory, increases steadily through decade 5.

A steady decline marks the trend of age class 70 through 119, but by decade 5 the amount is still greater than the youngest two vegetation groups. This vegetation community lacks pioneer species, but late successional species understory species are present. Shade tolerant understory conifers become more prevalent in the age group 120 through 169. The area of this group increases through decade 2, then drops by decade 5. The age group of 170 years and older often, but not always, includes most old-growth attributes. This age group declines slightly in the first decade as a result of harvest, but increases substantially thereafter through decade 5. Stands moving up in age faster than the harvest rate are the reason for this steady increase.

Although this alternative attempts to maximize the amount of old growth by minimizing the are subject to timber harvest, the lands subject to timber harvest are managed very intensively. As a result, the average rotation age is lower, and the proportion of old growth is only one sixth of the timber harvest lands -- the lowest of any alternative.

This alternative provides a good deal of the diversity characterized by old growth timber, but relatively little diversity of pioneer species and early seral plants, when compared with the other alternatives except alternative I.

Alternative I

Under this alternative about 64 percent of the forested area would be devoted to nonconsumptive use of vegetation. ASQ and other planned consumption of Forest vegetation resources would be based on full yield from only 1 percent of the forested area. Reduced harvest rates would be assigned to 35 percent of the forested area.

Direct and Indirect Effects

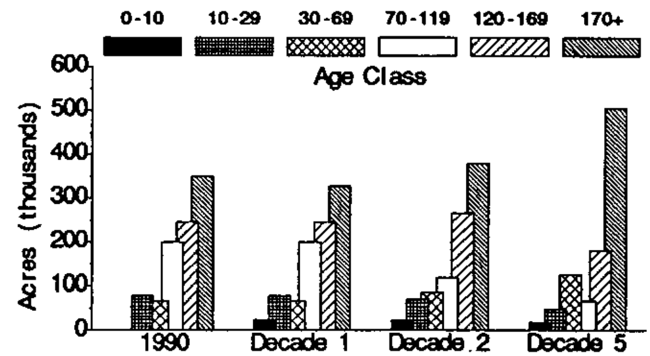
Standards for vegetation management practices would be met by this alternative, because it uses the latest information about land suitability for timber management. Stocking levels on cutover land would be returned to minimum or prescribed levels within five years.

This alternative includes Management Requirements (MRs) and emphasizes habitat requirements for fish and wildlife. The MRs are parcels of land set aside to meet minimum habitat requirements for pileated wood peckers, pine marten, and northern spotted owls. Isolation of MRs would be greatly reduced, and vegetation mosaics would be more continuous. Effectiveness of the MRs would be secure because edges exposed to windthrow would be greatly reduced, and harvest activities could be paced to provide protection from adjacent managed stands. Retention of large woody material would result in relatively high continuous fuel levels.

Very little land would be devoted to dominant timber use. Timber issues such as growth enhancement, tree improvement, fertilization, and mortality capture would always be subject to the needs of the resource emphasized by the individual Management Areas.

The vegetation mosaic under alternative I would emphasize advanced immature, mature, and overmature age classes. More area would have an uneven-aged structure.

Figure IV-18 Alternative I—Vegetation Trends by Vegetation Age Group



Cutover areas would have much more diversity than that exhibited by areas harvested between 1960 and 1980. Hemlocks and true firs would increase relative to areas cut between 1960 and 1980. Control of forest diseases and insect problems would be minimal.

Cumulative Effects

This alternative provides old growth in Wilderness, all ten roadless areas, Management Requirements (MRs), and special interest areas. It provides more old growth than all other alternatives except alternative H.

As shown in figure IV-18, the area of communities dominated by grasses, forbs, shrubs, and conifer seedlings would remain relatively constant through decade 2, and decrease by decade 5. The vegetation age-group in which conifers begin to dominate grasses, forbs, and shrubs (age 10 through 29) decreases steadily through decade 5. The age group of young fast-growing conifers (age 30 through 69) which has an impoverished understory, increases by decade 2 and almost doubles by decade 5.

A steady decline marks the trend of age class 70 through 119, but by decade 5 the amount is still higher than the youngest two vegetation groups. This vegetation community lacks pioneer species, but late successional species understory species are present. Shade tolerant understory conifers become more prevalent in the age group 120 through 169. The area of this group increases through decade 2, then drops by decade 5. The age group of 170 years and older often, but not always, includes most old-growth attributes. This age group declines slightly in the first decade as a result of harvest, but increases substantially thereafter through decade 5. Stands moving up in age faster than the harvest rate are the reason for this steady increase.

This alternative provides a good deal of the diversity characterized by old growth timber, but relatively little diversity of pioneer species and early seral plants, when compared with the other alternatives except alternative H.

Alternative Q

This alternative is the Forest's final Preferred Alternative.

Under this alternative about 59 percent of the forested area would be devoted to nonconsumptive use of vegetation. ASQ and other planned consumption of Forest vegetation resources would be based on full yield from 17 percent of the forested area, but reduced harvest rates would be assigned to 24 percent of the forested area

Direct and Indirect Effects

Standards for vegetation management practices would be met, because this alternative uses the latest information about land suitability for timber management. Stocking levels on cutover land would be returned to minimum or prescribed levels within five years.

Timber harvest would be an important tool to manipulate vegetation for achieving Forest objectives of non-timber resources.

This alternative includes Management Requirements (MRs). The MRs are parcels of land set aside to meet minimum habitat requirements for pileated wood peckers, pine marten, and northern spotted owls. The MRs are usually isolated from each other by land that will eventually become cutover. Effectiveness of the MRs may sometimes be eroded by windthrow because they tend to have a lot of exposed edge. Standards for retention of large woody material would result in relatively high fuel levels.

This alternative adds Management Areas for deer and elk summer and winter range, and back country lakes. Vegetation management practices in these areas would reflect requirements for deer and elk, and water quality. This alternative also adds a Management Area for special old growth, where change would be limited to that cause by natural processes.

The vegetation mosaic would be composed of a broad range of age-classes. Patterns would be evenly-distributed, and the area of each age class would be comparable to the others.

Figure IV-19 Alternative Q--Vegetation Trends by Vegetation Age Group

More area would have an uneven-aged structure because more land is allocated to scenic viewsheds. Other cutover areas would have about the same amount of diversity as that exhibited by areas harvested between 1960 and 1980, with the addition of snags and green tree replacements in cutting prescriptions. Hemlocks and true firs would increase relative to areas cut between 1960 and 1980.

Cumulative Effects

This alternative provides old growth and all its attendant values in reservations in Wilderness, roadless areas, Management Requirements (MRs), and special interest areas. Some old growth would remain in visually sensitive areas. Refer to the section on old growth in this chapter for further discussion.

As shown in figure IV-19, the area of communities featuring grasses, forbs, shrubs, and conifer seedlings would remain relatively constant through decade 5. The vegetation age-group in which conifers begin to dominate grasses, forbs, and shrubs (age 10 through 29) stays level through decade 2, then drops below current level by decade 5. The age group of young fast-growing conifers (age 30 through 69) which create an impoverished understory, increases by decade 2 and almost doubles by decade 5.

A steady decline marks the trend of age class 70 through 119. By decade 5 the amount is still higher than the two vegetation groups. This vegetation community lacks pioneer species, but late successional species understory species are present. Shade tolerant understory conifers become more prevalent in the age group 120 through

169. The area of this group increases through decade 2, then drops by decade 5. The age group of 170 years and older often, but not always, includes most old-growth attributes. This age group declines slightly in the first decade as a result of harvest, but increases substantially thereafter through decade 5. Stands moving up in age faster than the harvest rate are the reason for this steady increase.

About 23% of forested lands where harvest is allowed would still posses most old-growth attributes by decade 5. This is a higher proportion of timber harvest lands with old growth than any other alternative.

Mitigation

Mitigating measures are designed to protect or enhance forest land vegetation. Management activities in all alternatives will be governed by Forest-wide Standards and Guidelines which include management requirements and Best Management Practices. Direction provided in the management areas is another source of mitigation measure description and direction.

The effectiveness of any mitigation measure will depend on a complex variety of site-specific conditions. The conditions and resultant impacts are analyzed during project level planning in an environmental analysis. Project planners and appropriate line managers will select the combination of mitigation measures which best address the nature and degree of risk of the impacts from the specific project. Most mitigation techniques have been developed from research results, as well as from practical on-the-ground experience on what is effective. Monitoring will also be used to enhance the effectiveness of mitigation measures.

Dispersing harvest units reduces effects on watershed, some kinds of wildlife, and scenery. Dispersal can increase windthrow because it increases the amount of edge per unit area.

A variety of species and ages of vegetation for wildlife, fish, soil, and watershed resources will be provided on the Forest at all times through planting, seeding, and encouraging natural regeneration. Plant diversity would be encouraged by planting at densities lower than used in the past. Ground vegetation would tend to occupy the additional space. Health and stand vigor would be improved through encouraging species diversification in all management practices.

Prescriptions for prescribed burning and other forms of site preparation and vegetation management strive to limit the intensity of treatment. This helps to preserve the ability of the plant community to return to the desired ecological diversity through normal succession in the years after harvest.

The Forest Plan includes a monitoring strategy to evaluate how well we are meeting the standard for diversity.

Planting would increase useful tree biomass production by shortening the time trees are absent. Bare soil would be held in place by litter layers and new live root masses. Created openings would be *"greened up"* more quickly than if left to natural regeneration.

Acceptable stocking levels would be achieved within five years of regeneration harvest. Natural regeneration, which is dependent on periodic seed crops, cannot always be assured within five years. Where natural regeneration is the preferred method, adequate stocking would almost always occur within five years. Failure to achieve minimum stocking within five years with any method would be a rare occurrence. It would always be followed by continued efforts to achieve minimum stocking, and would remain active until fully mitigated.

Snags and logs left for wildlife would provide at least minimum amounts of nutrients for recycling through the soil to replace harvested and burned vegetation. Down logs are a component of very stable ecosystems and contribute to long-term productivity, as apparent in ecosystems which have survived longer than a century.

Sensitive plant species would be protected from degradation:

- Biological evaluations would determine, presence, location, amount, and extent of sensitive plants before any management activity.
- Project design would be modified to ensure survival of the located plants.

Even-aged management is the predominant silvicultural strategy on the Mt. Hood National Forest. Spacial distribution of units will, over time, develop a mosaic of age classes and heterogeneous fuel profiles that will be more resistant to the spread of major wildfires than would a homogeneous arrangement. Interlocking crowns, large accumulations of surface fuels, and understory vegetation, would be broken up by areas with relatively low flammability. Fire suppression effectiveness would be increased as a result of discontinuous fuel profiles, and improved access.

Units would remain relatively fire-resistant until silvicultural activities, such as precommercial thinning, begin to contribute to the buildup of fine fuels. Plantations often shade old logging slash, presenting a hazardous fuel complex. The potential rate of spread will drop sharply and then start to increase again after each commercial thinning operation and fuel treatment.

Harvest cutting methods such as shelterwood, seed tree, single-tree selection, and group selection, also modify vegetation. This serves to reduce spread of major fires, but to a lesser degree than clearcutting. Any activity taking place on a timber sale area would be covered in the timber sale contract. The contract includes the requirements for equipment and operating procedures that reduce the potential for fire on timber sales. These precautionary measures would be used in each alternative. In spite of these measures, some fires would probably escape, but there would not be any significant change from historic levels

Forestwide standards would provide some protection to western yew.

Potential Conflicts with Plans and Policies of other Jurisdictions

Please refer to the end of this chapter for a discussion of the possibility of conflicts between the alternatives and the plans and policies of other jurisdictions with responsibility or authority for this environmental component. The relation of these alternatives to the Forestry Plan for Oregon is discussed in detail at the end of this chapter.

Old Growth

Introduction

Old-growth is our link with the living past, the urgent present, and the possible future.

The dilemma of old growth lies in its importance to environmental and spiritual values, and in its truly exceptional quality for lumber and wood products. We need homes and livelihood, and a place to refresh our busy lives. Plant and animal communities need a place to exist and thrive. The land base is finite and cannot be increased. Gains in one desired resource can only be achieved at the expense of others.

Issues of old growth are very complex and occur on local, regional, and national levels. (Refer to Chapters II and III for differing definitions and values of old growth.) Of concern are the amount and distribution of the stands remaining, questions about the possibility of replacing old growth in the future, and the long period of time it would take to grow replacement old growth once harvested. The amounts and distribution of natural old-growth forest stands are addressed in this section (Refer to related discussions in this chapter on Soils, Vegetation, Wildlife, Fish, and Fire.)

There are about 345,000 acres of old-growth forest on the Mt. Hood. About 86,000 acres of the total, including 31,000 acres in wilderness areas, is unsuitable for timber harvest (See Chapter II for a discussion of land suitability for timber harvest), and the remaining 259,000 acres are tentatively suitable.

Old growth means different things to different people, and there are a number of published definitions (See Chapter III). Even so, similarities between ways of estimating amounts of old growth help explain effects of alternatives. About 345,000 acres (Chapter III, Table III-5) of stands that meet currently accepted definitions of old-growth have been identified (Refer to Chapter III, Tables III-2 and III-3 for a list of characteristics).

As mature natural stands develop, they slowly take on the attributes of old growth. Some trees die and fall over. Others are broken off, become defective, or develop large limbs and ragged crowns. Eventually, mature natural stands assume most of the size, age, structural, and understory characteristics needed to qualify as old growth. The amount of existing old growth plus the area expected to acquire old-growth attributes is termed "potential old growth including in-growth". The same cannot be said of managed stands. Managed stands develop under a history far different from that of the natural forest. We will not know for many generations which of the attributes of old growth we can recover by holding managed stands on the stump.

Accounting for change and renewal is a conservative, indeed essential, element of any evaluation of living systems such as old growth. Trees and ecosystems, even the most ancient ones, must eventually be renewed through the force of time. If the average life span of an old-growth stand is 500 years (some are a few hundred years older, and many are much less), the natural cycle would have to replace about 1/5 of one percent of the total acreage per year on the average in order to maintain old-growth conditions overall. This amount of replacement is called in-growth -- the amount of forest acquiring the requisite attributes to be called old growth.

The Mt. Hood National Forest has over 240,000 acres of mature forest old enough to develop into potential old-growth within fifty years. In the presence of modern fire management, it is likely that nearly all will survive that long, except that which is harvested.

Table IV-14, shows the estimated amount of existing old growth that will remain in fifty years. The potential amount including in-growth is also shown. The former category does not adequately portray the quality of the forest environment provided by the alternatives. The latter estimate is probably optimistic.

This sets a framework for a discussion of the effects of alternatives on old growth. The cumulative effects of the alternatives are tied to the level of harvest.

Overview of Direct and Indirect Effects of Timber

The sale and harvest of old growth causes a sudden change to the grass/forb successional stage. Most harvested area will be harvested again before it can reach the age of current old-growth stands. Old growth on Management Areas with long rotations would be eventually be harvested. Replacement stands would be allowed to reach old age before being harvested again, but some characteristics of natural old growth would not be recovered.

The size, shape, and arrangement of old-growth stands affect their integrity as habitat for plants and animals. Refer to the discussions on wildlife, fisheries, and sensitive plants in this chapter for more information. Harvest of old growth will separate components, reduce their size, increase the amount of edge, and reduce habitat effectiveness for some species. As the size of old-growth stands is reduced through timber harvest, habitat effectiveness begins to decline faster than the reduction of old-growth acres would indicate.

Effects of Integrated Pest Management on Old Growth

Pest control or the lack of it will affect the condition of old growth stands in all alternatives. Insect and disease epidemics have occurred before, and will no doubt occur again. Control activities may be needed to protect old growth stands, as well as managed stands.

Alternatives F, H, I, and Q have the most old growth remaining by the fifth decade, so the probability of insect epidemics is correspondingly higher. The value of managed stands in alternatives NC, A, C, and E would be high. The probability of a response effort to control epidemics may be just as high, but the effects would not occur on old-growth stands.

Effects of Mining, and Energy Development on Old Growth

Mineral and energy extraction can change or completely remove old growth through clearing for physical developments associated with these activities. Mineral extraction is extremely speculative and has been sporadic. In the event that some development does occur, Forest-wide Standards and Guidelines would be enforced.

Effects of Land Uses on Old Growth

Land use grants and land exchanges are administrative activities with a potential effect on old growth. Land exchanges usually result in changes that are dependent on the objectives of the new owner. Many land exchanges will result in the harvest of affected old growth.

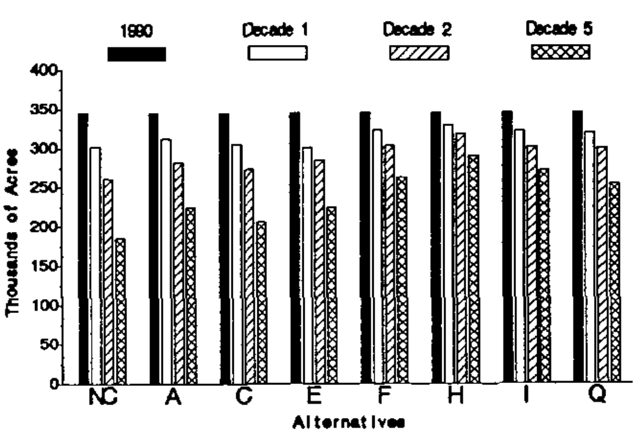
The granting of a special use permit may result in destruction of old growth, but the acreage involved is usually small.

The effects of land exchanges and special uses would not differ greatly between alternatives.

Effects of Roads on Old Growth

Road construction clears about five acres of vegetation for each mile of road built. This clearing is a permanent conversion to non-forest, and a one for one reduction when it occurs in old growth stands.

Figure IV-20 Trends of Original Old Growth on All Forested Lands



Since the amount of road construction is correlated with level of timber harvest, the effects on old growth are proportional also. Alternatives NC, A, C, and E would have more effects of road construction on old growth than the others

Related ICOs

- Maintenance and distribution of Old Growth
- Viable populations of spotted owls
- Decreasing supply of old growth stands

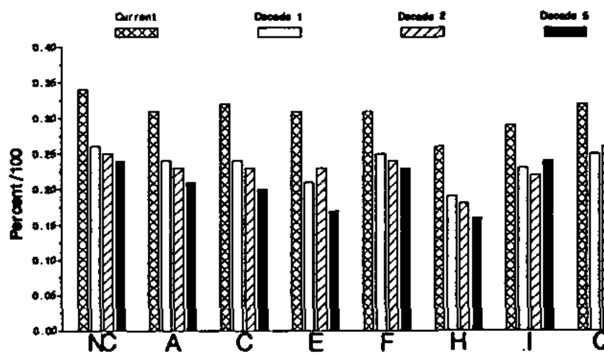
Direct and Indirect Effects on Old Growth By Alternative

Old-growth would be reserved in all alternatives; only the amount varies. Tables IV-13 and IV-14 show that lands where harvest is allowed tend to lose old growth at various rates determined by harvest level. When in-growth all on forested lands is accounted for, the potential old growth actually goes up in all alternatives. This seeming paradox results from the dynamic evolution of mature natural stands into the potential old growth class on lands where harvest is not allowed.

Forestry practices proposed in the alternatives of this FEIS have provisions for capturing and retaining many old-growth characteristics on lands where harvest of timber products is allowed. There is no way to fully duplicate all attributes after harvest, even with very long rotations.

Refer to the section on wildlife in this chapter, Figures IV-20 and IV-21 give a visual picture of the data shown in Tables IV-13 and IV-14, for analysis of the components of old growth considered important for wildlife. The analytical assumptions for effects on old growth account for in-growth into the old-growth class and start from the old growth inventory described in Chapter II and III.

Figure IV-21 Trends of Old Growth on Lands Where Harvest is Allowed



Alternative NC

Alternative NC represents No Change from Timber Management Plan. It has no MRs and uses an outdated assessment of land suitability. The amount of old growth would decline steadily on lands where harvest is allowed to 131.2 thousand acres after five decades. Harvest would remove about 38,000 acres each decade, on the average. Old growth attributes would develop in natural mature stands to replace much of what is harvested. Eventually, harvest would convert all eligible natural mature stands, and further recruitment into the old-growth class would become impossible. These effects would take much longer than the projection period covered by this EIS.

Table IV-13 Area of Old Growth to be Harvested Decade 1, 2 and 5

Lands where Harvest is Allowed	Alternative (Thousands of Acres)							
	NC	A	C	E	F	H	I	Q (Preferred)
Decade 1	43.2	32.6	39.6	44.5	21.6	15.1	22.7	24.5
Decade 2	41.0	30.9	35.3	16.0	20.3	11.7	21.0	20.9
Decade 5	32.3	28.7	32.6	21.1	15.9	10.8	17.0	19.2

Table IV-14 Amount of Old Growth, Decades 1, 2, and 5

Decade	Unit of Measure	Alternative							
		NC	A	C	E	F	H	I	Q (Preferred)
All Lands - Existing Old Growth Remaining	M Acres 1990	345.3	345.3	345.3	345.3	345.3	345.3	345.3	345.3
1	M Acres	302.1	312.7	307.7	300.8	323.7	330.2	322.6	320.6
2	M Acres	261.1	281.8	272.4	284.8	303.3	318.5	301.7	299.7
5	M Acres	185.6	225.0	205.5	223.9	262.0	290.1	271.5	254.6
All Lands - Potential[1] Old Growth Including In-growth or Accretion of Old Growth Attributes	M Acres 1990	345.3	345.3	345.3	345.3	345.3	345.3	345.3	345.3
1	M Acres	302.1	312.7	307.7	300.8	323.6	330.2	322.6	320.6
2	M Acres	335.5	356.1	346.8	359.1	377.7	392.8	375.9	373.3
5	M Acres	400.8	443.7	422.3	429.6	493.1	523.3	500.3	475.1
Harvest Permitted	M Acres 1990	187.7	134.0	153.3	131.7	103.6	55.9	98.4	122.0
1	M Acres	144.5	101.4	113.7	87.2	81.9	40.8	75.7	97.3
2	M Acres	137.7	97.2	107.4	97.8	79.7	39.7	73.3	99.1
5	M Acres	131.2	88.2	93.3	69.8	76.2	35.0	81.6	95.2
Harvest Not Permitted	M Acres 1990	157.6	211.3	194.0	213.6	241.7	289.4	246.9	223.3
1	M Acres	157.6	211.3	194.0	213.6	241.7	289.4	246.9	223.3
2	M Acres	197.8	258.9	239.4	261.3	298.0	353.1	302.6	274.2
5	M Acres	269.6	355.5	328.5	359.8	416.9	488.3	418.7	379.9

[1] *Existing currently, minus amount harvested, plus amount entering class from existing mature natural stands.*

The amount of potential old growth on lands where harvest is not allowed would increase substantially owing to recruitment of old growth attributes in stands which are now mature. After five decades the total area of forest with old growth character would be about 269.6 thousand acres. Further recruitment of stands which are now mature would occur, and eventually the entire forested area would assume old growth attributes except that which is destroyed by fire, windstorm, volcanic action, or any natural catastrophe.

The total amount of old growth after five decades is expected to be about 400,000 acres, more than 40% of the forested area of the Mt. Hood National Forest.

Alternative A

Alternative A differs from Alternative NC in two ways: It includes MRs and uses the latest assessment of land suitability. The amount of old growth would decline steadily on lands where harvest is allowed to 87.4 thousand acres after five decades. Harvest would remove about 30,000 acres each decade, on the average. Old growth attributes would develop in natural mature stands to replace some of what is harvested. Eventually, harvest would convert all eligible natural mature stands except those in the MRs, and further recruitment into the old-growth class would be limited to mature natural stands in the MRs. These effects would take much longer than the projection period covered by this EIS.

The amount of potential old growth on lands where harvest is not allowed would increase substantially owing to recruitment of old growth attributes in natural stands which are now mature. After five decades the area of forest with old growth character would be about 356.3 thousand acres. Further recruitment of stands which are now mature would occur, and eventually the entire forested area would assume old growth attributes except that which is destroyed by fire, windstorm, volcanic action, or any natural catastrophe.

The total amount of old growth after five decades is expected to be about 444,000 acres, more than 45% of the forested area of the Mt. Hood National Forest.

Figure IV-22 Old Growth Estimate Alternative NC

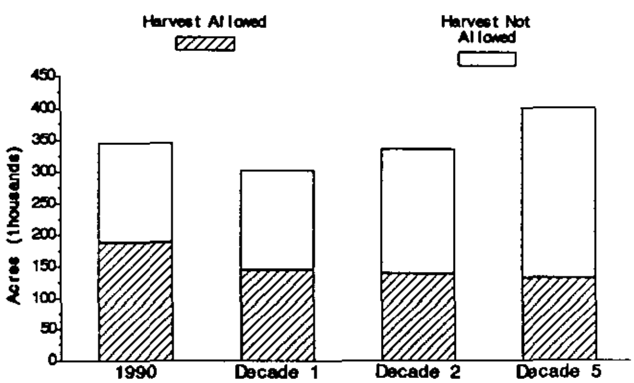
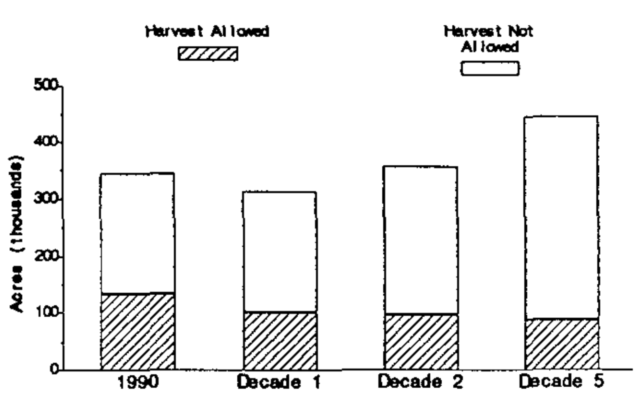


Figure IV-23 Old Growth Estimate Alternative A



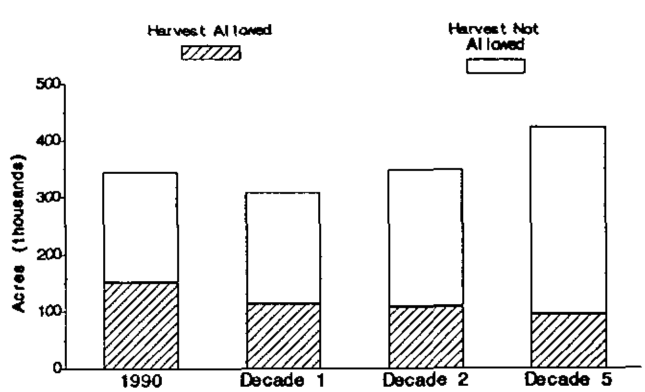
Alternative C

Alternative C differs from Alternative NC in at least three ways: It includes MRs, uses the latest assessment of land suitability, and allocates less land to consumption of forest resources. The amount of old growth would decline steadily on lands where harvest is allowed to 93.3 thousand acres after five decades. Harvest would remove about 34,000 acres each decade, on the average. Old growth attributes would develop in natural mature stands to replace some of what is harvested. Eventually, harvest would convert all eligible natural mature stands except those in the MRs, and further recruitment into the old-growth class would be limited to mature natural stands in the MRs. These effects would take much longer than the projection period covered by this EIS.

The amount of potential old growth on lands where harvest is not allowed would increase substantially owing to recruitment of old growth attributes in natural stands which are now mature. After five decades the area of forest with old growth character would be about 329.0 thousand acres. Further recruitment of stands which are now mature would occur, and eventually the entire forested area would assume old growth attributes except that which is destroyed by fire, windstorm, volcanic action, or any natural catastrophe.

The total amount of old growth after five decades is expected to be about 422,000 acres, about 45% of the forested area of the Mt. Hood National Forest.

Figure IV-24 Old Growth Estimate Alternative C

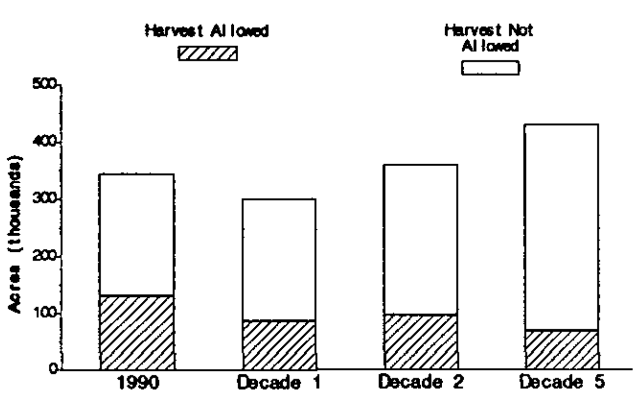


Alternative E

Alternative E differs from Alternative NC in at least four ways: It includes MRs, uses the latest assessment of land suitability, devotes less land to consumption of forest resources, and initially harvests at a rate higher than the long term sustained yield capacity (LTSYC). The amount of old growth would decline steadily on lands where harvest is allowed to 69.0 thousand acres after five decades. Harvest would remove about 44,000 acres of old growth the first decade. The harvest rate of old growth would fluctuate to a low of about 16,000 acres in the second decade to about 21,000 acres in the fifth decade. Old growth attributes would develop in natural mature stands to replace some of what is harvested. Eventually, harvest would convert all eligible natural mature stands except those in the MRs, and further recruitment into the old-growth class would be limited to mature natural stands in the MRs. These effects would take much longer than the projection period covered by this EIS.

The amount of potential old growth on lands where harvest is not allowed would increase substantially owing to recruitment of old growth attributes in natural stands which are now mature. After five decades the area of forest with old growth character would be about 360.6 thousand acres. Further recruitment of stands which are now mature would occur, and eventually the entire forested area would assume old growth attributes except that which is destroyed by fire, windstorm, volcanic action, or any natural catastrophe.

Figure IV-25 Old Growth Estimate Alternative E



The total amount of old growth after five decades is expected to be about 429,000 acres, more than 45% of the forested area of the Mt. Hood National Forest.

Alternative F

Alternative F differs from Alternative NC in at least three ways: It includes MRs, uses the latest assessment of land suitability, and allocates much less land to consumption of forest resources. The amount of old growth would decline steadily on lands where harvest is allowed to 74.9 thousand acres after five decades. Harvest would remove about 20,000 acres each decade, on the average. Old growth attributes would develop in natural mature stands to replace some of what is harvested. Eventually, harvest would convert all eligible natural mature stands except those in the MRs, and further recruitment into the old-growth class would be limited to mature natural stands in the MRs, mature natural stands managed on long rotations, and possibly some replacement stands managed specifically to regain old growth attributes. These effects would take much longer than the projection period covered by this EIS.

The amount of potential old growth on lands where harvest is not allowed would increase substantially owing to recruitment of old growth attributes in natural stands which are now mature. After five decades the area of forest with old growth character would be about 418.2 thousand acres. Further recruitment of stands which are now mature would occur, and eventually the entire forested area would assume old growth attributes except that which is destroyed by fire, windstorm, volcanic action, or any natural catastrophe.

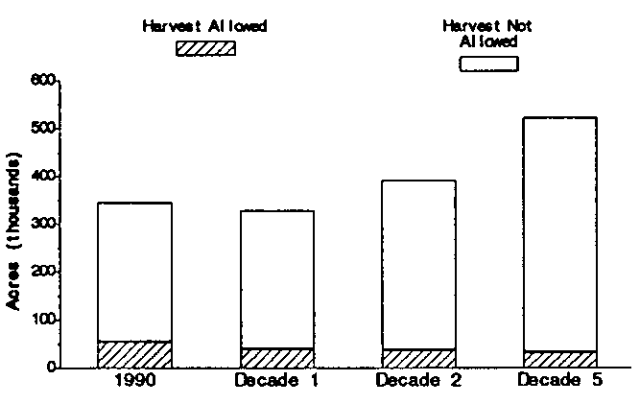
Figure IV-26 Potential Old Growth Estimate Alternative F

The total amount of old growth after five decades is expected to be about 493,000 acres, more than half of the forested area of the Mt. Hood National Forest.

Alternative H

Alternative H, the old growth alternative, differs from Alternative NC in at least three ways: It includes MRs, uses the latest assessment of land suitability, and allocates the least amount of land of any alternative to consumption of forest resources. The amount of old growth would decline steadily on lands where harvest is allowed to 33.0 thousand acres after five decades. Harvest would remove about 13,000 acres of old growth each decade, on the average. Old growth attributes would develop in natural mature stands to replace some of what is harvested. This alternative has the longest average rotation age of any alternative on lands where harvest is allowed -- almost 200 years. Eventually, harvest would convert all eligible natural mature stands except those in the MRs, and further recruitment into the old-growth class would be limited to mature natural stands in the MRs, mature natural stands managed on long rotations, and possibly some replacement stands managed specifically to regain old growth attributes. These effects would take much longer than the projection period covered by this EIS.

Figure IV-27 Old Growth Estimate Alternative H



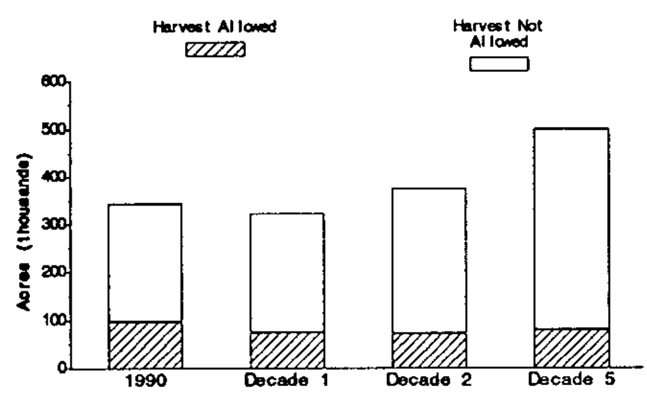
The amount of potential old growth on lands where harvest is not allowed would increase substantially owing to recruitment of old growth attributes in natural stands which are now mature. After five decades the area of forest with old growth character would be about 490.3 thousand acres. Further recruitment of stands which are now mature would occur, and eventually the entire forested area would assume old growth attributes except that which is destroyed by fire, windstorm, volcanic action, or any natural catastrophe.

The total amount of old growth after five decades is expected to be about 523,000 acres, more than 55% of the forested area of the Mt. Hood National Forest.

Alternative I

Alternative I differs from Alternative NC in at least three ways: It includes MRs, uses the latest assessment of land suitability, and allocates much less land to consumption of forest resources. The amount of old growth would decline steadily on lands where harvest is allowed to 80.2 thousand acres after five decades. Harvest would remove about 18,000 acres each decade, on the average. Old growth attributes would develop in natural mature stands to replace some of what is harvested. Eventually, harvest would convert all eligible natural mature stands except those in the MRs, mature natural stands managed on long rotations, and possibly some replacement stands managed specifically to regain old growth attributes. These effects would take much longer than the projection period covered by this EIS.

Figure IV-28 Old Growth Estimate Alternative I



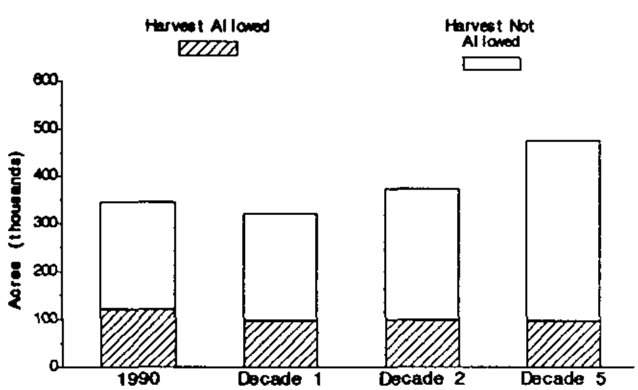
The amount of old growth on lands where harvest is not allowed would increase substantially owing to recruitment of old growth attributes in natural stands which are now mature. After five decades the area of forest with old growth character would be about 420.1 thousand acres. Further recruitment of stands which are now mature would occur, and eventually the entire forested area would assume old growth attributes except that which is destroyed by fire, windstorm, volcanic action, or any natural catastrophe.

The total amount of old growth after five decades is expected to be about 500,000 acres, more than half of the forested area of the Mt. Hood National Forest.

Alternative Q

Alternative Q, the preferred alternative, differs from Alternative NC in at least three ways: It includes MRs, uses the latest assessment of land suitability, and allocates less land to consumption of forest resources. The amount of old growth would decline steadily on lands where harvest is allowed to 94.2 thousand acres after five decades. Harvest would remove about 22,000 acres each decade, on the average. Old growth attributes would develop in natural mature stands to replace some of what is harvested. Eventually, harvest would convert all eligible natural mature stands except those in the MRs. Further recruitment into the old-growth class would be limited to mature natural stands in the MRs, mature natural stands managed on long rotations, and possibly some replacement stands managed specifically to regain old growth attributes. These effects would take much longer than the projection period covered by this EIS.

Figure IV-29 Old Growth Estimate Alternative Q



The amount of potential old growth on lands where harvest is not allowed would increase substantially owing to recruitment of old growth attributes in natural stands which are now mature. After five decades the area of forest with old growth character would be about 380.9 thousand acres. Further recruitment of stands which are now mature would occur, and eventually the entire forested area would assume old growth attributes except that which is destroyed by fire, windstorm, volcanic action, or any natural catastrophe.

The total amount of old growth after five decades is expected to be about 475,000 acres, about half of the forested area of the Mt. Hood National Forest.

Cumulative Effects of the Alternatives On Old Growth

The cumulative effects of the alternatives on old growth are correlated with harvest level. Timber harvest and road construction are the greatest agents of change. The cumulative effects of road construction are essentially permanent. Alternatives with longer average rotations would permit recovery of some attributes of old growth over the very long run, with a corresponding reduction of the cumulative effects. Alternatives F and Q have the longest average rotation length. Alternatives NC and C have the shortest average.

Three important aspects of the old-growth environment are wildlife habitat, ecosystem diversity, and esthetic value. These elements also register cumulative effects in different ways that are tied to the geographic location of the various Management Areas in the alternatives. For example, alternative F emphasizes old growth in sensitive viewsheds, whereas alternative E emphasizes concentration along the major rivers and streams. Acre for acre cumulative effects on the wildlife component of old growth could be far different from effects on visual quality. Old growth that is essential for wildlife habitat may be unimportant from a visual quality standpoint because it is not in a sensitive viewshed. The reverse could also be true. The interrelated aspects of the old-growth issue are exceedingly complex.

Mitigation Measures

All alternatives except Alternative NC are designed to meet legal requirements (36 CFR 219.27) for the preservation and enhancement of diversity of plant and animal communities. A network of Management Requirement areas (MRs) is provided under all alternatives except the No Change (NC). Wildlife Indicator Species for these areas are the northern spotted owl, pileated woodpecker, and the pine marten. For additional information on the size of areas set aside for these species, refer to the wildlife sections in Chapters II, III, and IV. In addition, riparian Standards and Guidelines will maintain mature and old growth stands in many areas adjacent to streams. Riparian areas will provide corridors of older, connecting habitat between MR areas.

Some mitigation of the effects of harvest is possible by saving components of old growth such as large trees, snags, down woody debris, and multi-layered stands. This does not retain the entire old growth system, but may allow for quicker recovery to old growth character in the future.

Wilderness areas, much of the Bull Run Watershed, and other Management Areas where harvest is precluded also maintain significant areas of old growth. Mature forest in these protected areas, and in the MRs, will develop old growth character over time. This developing mature forest is mainly responsible for the increase in old-growth acres through the fifth decade.

Sensitive Plants

Significant Interactions

Timber harvesting and road building are land-disturbing activities that affect and can severely impact populations of sensitive plants within and adjacent to the project areas. Other land-disturbing activities, such as trail work, wildlife habitat and fisheries enhancement projects can impact small populations of sensitive plants. Land-disturbing activities which change the hydrologic regime of site conditions can affect sensitive plant habitats.

Some sensitive plants rely on the habitat provided by early seral stages. Timber harvesting may be beneficial to these plants, although the vegetative changes may have to be designed to benefit the intended plant species.

Grazing allotments can create impacts on sensitive plant species by livestock consuming the plants or through trampling, and by encouraging the introduction of exotic competing plant species.

Natural and prescribed fire can be detrimental, neutral, or beneficial to sensitive plant populations, depending on the plant species, the season, and the temperature of the burn.

Recreation facilities and activities could have an adverse effect on some sensitive plant species, especially those plants which occur in meadows or in subalpine habitats in the vicinity of ski facility developments and structures.

Land allocations affect sensitive plant communities. Designations such as Research Natural Areas (A-3), Special Interest Areas (A-4), Wilderness (A-2), Designated Wild, Scenic and Recreational Rivers (B-1), the Columbia Gorge Scenic Area (E), the Bull Run Watershed Management Unit (D), Spotted Owl Habitat Areas (A8), Pileated Woodpecker/Pine Marten Habitat Areas (B-5), and Key Site Riparian areas (A-9) can provide protection to sensitive plant populations. Timber Emphasis (C-1) management areas provide the least protection to sensitive plants and could potentially have an adverse affect on populations of sensitive plant species that occur within or adjacent to these areas.

Direct and Indirect Effects

The management objective for sensitive plants is to provided habitat capable of indefinitely supporting sensitive plant species. Alternatives that emphasize intensive timber harvest activities (NC, A, and C) are most likely to have an impact on habitat suitable for sensitive plants. Alternatives that allocate the most land to categories other than Timber Emphasis (H and I) result in better protection for sensitive plant habitat. Alternatives with lower timber harvests also have fewer roads, and this means less potential impact on sensitive plants. The remaining alternatives (Q, F, and E) will have a moderate adverse effect on sensitive plant habitats.

Cumulative Effects

In those alternatives (NC, A, and C) that emphasize timber harvest activities, habitat modification and the loss of genetic diversity, over time could result in a decline of populations of sensitive plant species that occur within or adjacent to these areas.

Mitigation

The Standard and Guidelines for all management activities contain measures to prevent overall loss of sensitive plant species and their habitats. These Standards and Guidelines would apply no matter which alternative is selected. Because of this, the possibility of disappearance of a sensitive plant species from the Forest, due to project activity, is remote. However, the distribution and abundance of populations can vary as a consequence of implementing the various alternatives.

Table IV-15 Sensitive Plant Species

Sensitive Plant Species	Common Name of Species	Sensitive Plant Species	Common Name of Species
Agoseris elata	tall agoseris	Lewisia columbiana v. columbiana	Columbia lewisia
Agrostis howellii	Howell's bentgrass	Lomatium laevigatum	smooth desert-parsley
Arabis furcata	cascade rockcress	Lomatium watsonii	Watson's desert-parsley
Arabis sparsiflora v. atrorubens	sickle-pod rockcress	Lycopodium annotinum	Stiff club moss
Aster gormanii	Gorman's aster	Lycopodium complanatum	fir club-moss
Astragalus howellii v. howellii	Howell's milk-vetch	Lycopodium inundatum	bog club-moss
Bolandra oregana	Oregon bolandra	Lycopodium selago	fir club-moss
Botrychium lanceolatum	lance-leaved grape-fern	Meconella oregana	meconella
Botrychium lunaria	moonwort	Montia diffusa	branching montia
Botrychium montanum	mountain grape-fern	Ophioglossum vulgatum	adder's tongue
Botrychium pinnatum	pinnate grape-fern	Penstemon barrettiae	Barrett's penstemon
Calamagrostis breweri	Brewer's reedgrass	Phlox hendersonil	Henderson's phlox
Calochortus longebarbatus v. longebarbatus	long-bearded mariposa-lily	Poa laxiflora	loose-flowered bluegrass
Campanula scabrella	rough harebell	Potentilla villosa v. parviflora	villous cinquefoil
Carex limnophila	pond sedge	Ranunculus reconditus	obscure buttercup
Carex macrochaeta	Alaska long-awned sedge	Rorippa columbiae	Columbia cress
Cimicifuga elata	tall bugbane	Scheuchzeria palustris v. americana	Scheuchzeria
Lycopodium annotinum	Gold tread	Scribneria bolanderi	Bolander's grass
Corydallis aquae-gelidae	cold-water corydalis	Sisyrinchium sarmentosum	pale blue-eyed grass
Draba aureola	golden alpine draba	Streptopus streptopoides	krusea
Erigeron howellii	Howell's daily	Suksdorfia violacea	Violet suksdorfia
Erigeron Oreganus	Oregon daily	Sulivantia oregana	Oregon sullivantia
Fritillaria camschatcensis	Indian rice	Tauschia sticklandii	Strickland's tauschia
Hackelia diffusa v. diffusa	diffuse stickseed		
Hieracium longiberbe	long-bearded hawkweed		
Howellia acquatilis	howellia		

Aquatic Resources

Introduction

The impacts of management activities are assessed on two major aquatic resources: fish habitat and water quality. These resources, frequently referred to as "riparian-dependent" resources, are strongly affected by management of, and conditions within, adjacent riparian areas, as reported by Meehan, et. al., 1977; Chamberlin, 1982; Bottom et. al., 1985, and others. These systems and their allied resources are generally thought of as being adapted over long periods of time to a given range of variations in natural conditions. Environmental disturbances like floods, fires, windstorms, and severe drought cause the most important variations. Such events typically cause local changes in fish habitat and water quality by modifying the characteristics of riparian areas and aquatic habitats.

Forest management activities, especially those involving modifications of riparian areas or aquatic habitats, can have major effects on fish habitat and water quality. As brought out in Chapter III of this document, the extent and duration of these effects depend mainly on the frequency, magnitude, and geographic coverage of management activities. These activities impose an additional level of effects over and above those caused by natural disturbances. Resource management practices can often produce adverse effects on fish habitat and water quality unless they are carefully planned and carried out to maintain or improve specific aquatic resources.

A simple model is used to analyze the effects of management activities on fish and water resources. The model integrates four major variables:

- Accelerated delivery of sediment to aquatic ecosystems.
- A total of acres assigned to one of three riparian management strategies.
- Acres of other land allocations having high compatibility with riparian area management objectives.
- A measure of relative watershed conditions reflected by the hydrologic recovery model.

The relative weights assigned to each variable were based on its estimated accuracy and comparative importance in controlling future aquatic ecosystem conditions. The model measures future aquatic ecosystem stability on a scale from zero, the least stable, to ten, the most stable. The model was used to evaluate each alternative on a Forest-wide and a specific drainage scale. Specific drainages were analyzed to identify areas with conditions substantially better or worse than those contained in the Forest's average. The goal of the model is to reflect the cumulative effects of an array of land allocations and management activities, primarily timber harvest and road building, on the aquatic ecosystem over time. Most effects result indirectly from activities that can modify physical and biological characteristics of aquatic ecosystems. Physical characteristics of the systems include water quality, habitat complexity, channel stability, and watershed conditions. Refer to the Soil and Water Components in this chapter for additional information on environmental effects related to erosion and sedimentation, riparian areas and stream channels. Biological characteristics include the composition of vegetation, and the structure and diversity of the riparian area. Cumulative effects are examined primarily within the context of the Forest land base.

Extrapolations were drawn from basic, total model scores to estimate short term (20 years after plan implementation) and long-term trends (50 years) in aquatic conditions and *"extreme event"* changes in overall conditions at the end of that time period. Extrapolations assume *"major"* changes will be created by severe environmental disturbances such as windstorms or floods which have a predictable probability of occurring over a 50-year span.

Reported conditions for aquatic stability, long-term trend and "extreme event" occurrences assume that a variety of mitigation and rehabilitation measures would be routinely funded and applied on a timely basis. If these measures are inadequately funded, poorly designed, or incompletely applied, conditions of aquatic resources would be worse than described.

The Aquatic Habitat Stability Index (Appendix B) and extrapolations from it such as Smolt Habitat and Legal Trout Habitat Capability must be used with care. The index has not been field validated. It requires numerous assumptions, including that the four major variables used are the most powerful and available predictors of future aquatic habitat conditions. In spite of the fact that basin-wide, long-term modeling now involves high levels of uncertainty, it remains the most objective, standardized process for comparing trends in fish habitat and water quality between alternatives. All results should be used as providing a relative index or indicator of trends for the factors under consideration, such as Aquatic Habitat Stability, Smolt/Legal Trout Habitat Capability, or Watershed Conditions.

Significant Interactions

Fish and water have many uses. One type of use is consumptive, as mentioned in Chapter III. People use fish for pleasure or subsistence including ceremonial or commercial consumption. People on farms or in cities use water in a myriad of ways including the operation of fish hatcheries. Another use of fish and water is nonconsumptive which includes waterborne activities as well as the presence of a body of water as a part of the outdoor scenery.

Any alternative that projects a decline in the condition of the forest's aquatic resources would also forecast comparable reductions in their potential uses. Alternatives which would maintain aquatic conditions would in general maintain the level and range of their uses. Alternatives which would improve aquatic resources would generally expand future uses or increase the total range of potential uses.

Alternatives A and E fall into the maintenance category. Alternatives F, H, I, and Q project improved aquatic conditions and therefore increased potential uses. Alternatives NC and C reflects general Forest-wide declines in aquatic conditions. This occurs even with aggressive implementation of mitigation measures. The greatest levels of improvement in aquatic habitat conditions on the Forest, considered as a total environment, would occur in Alternatives Q, F, H, and I.

Related ICOs

Maintenance and rehabilitation of fish habitat and water quality.

Implementation of a program to rehabilitate and enhance anadromous and resident fish and wildlife habitat.

Implement the National initiatives and partnerships relating to wildlife and fisheries recovery and education efforts.

Direct and Indirect Effects of Alternative Activities on Aquatic Resources

Table IV-16 and Figures IV-30a to IV-30i provide information to compare the aquatic effects of alternatives. Stability describes the relative resistance of aquatic habitat to major losses in productive capability, given a normal level of natural disturbances such as windstorms, fires, and floods. An increasing diversity of riparian and aquatic micro-habitats within a given analysis implies a higher stability rating.

Extreme event trends predict aquatic habitat capability after extreme disturbances with 30% or less probability of occurrence in 50 years. For example the probability of two 100-year floods occurring in 50 years is 25% in any given year. Trends assume full implementation and maintenance of rehabilitation structures.

Recreation and fishing success, as well as commercial fisheries, are indirectly affected as fish population levels change.

Table IV-16 Aquatic Effects by Alternative
Forest Wide Summary*

Decades	Alternative							
	NC	A	C	E	F	H	I	Q (Preferred)
Decade 1	4.0	6.0	4.4	5.9	7.1	7.9	7.4	6.7
Decade 2	4.0	6.0	4.5	5.9	7.0	8.3	7.4	6.7
Decade 3	3.7	6.1	4.1	5.5	7.0	8.4	7.4	6.7
Decade 4	3.6	5.9	4.0	5.6	7.5	8.4	7.3	6.7
Decade 5	3.6	5.9	4.4	5.5	7.4	8.7	8.1	6.7

**Index*

Figure IV-30a Alternative NC

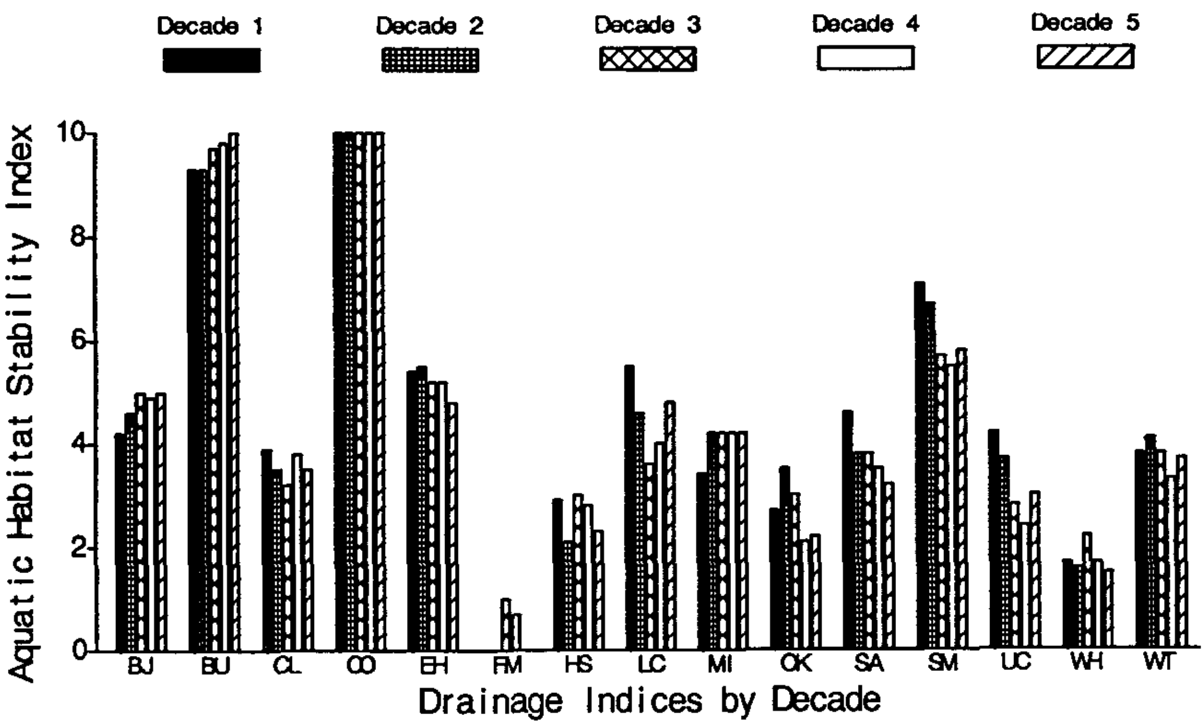


Figure IV-30b Alternative A

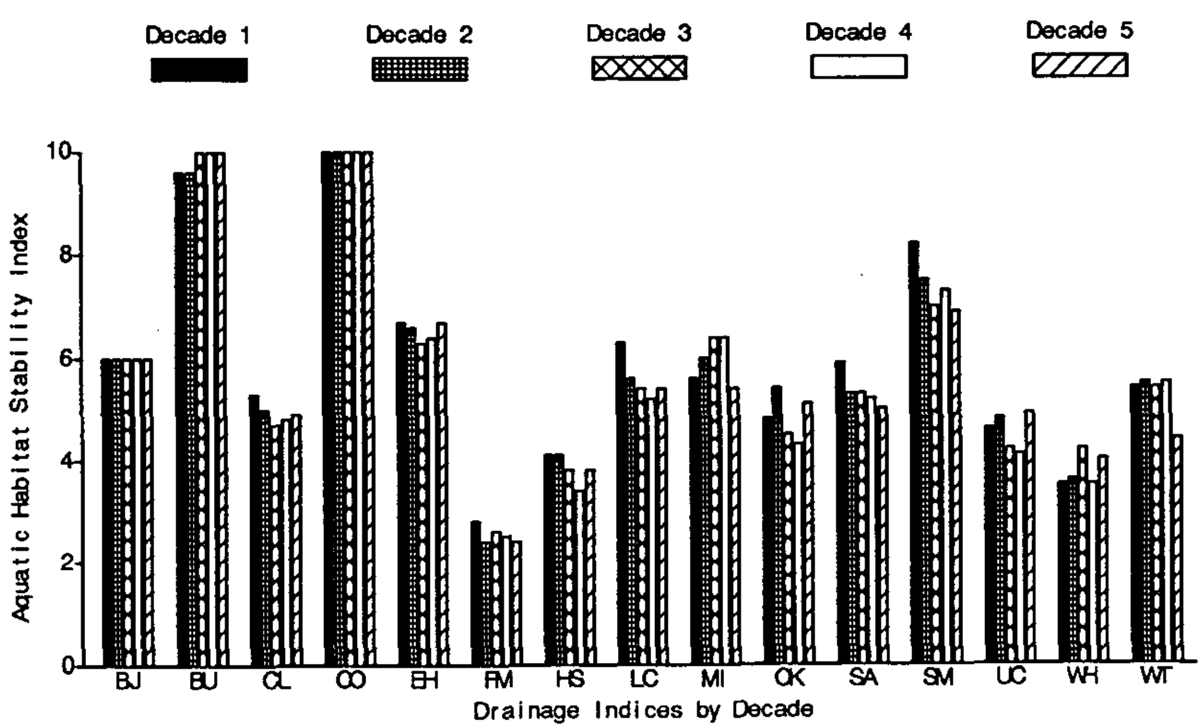


Figure IV-30c Alternative C

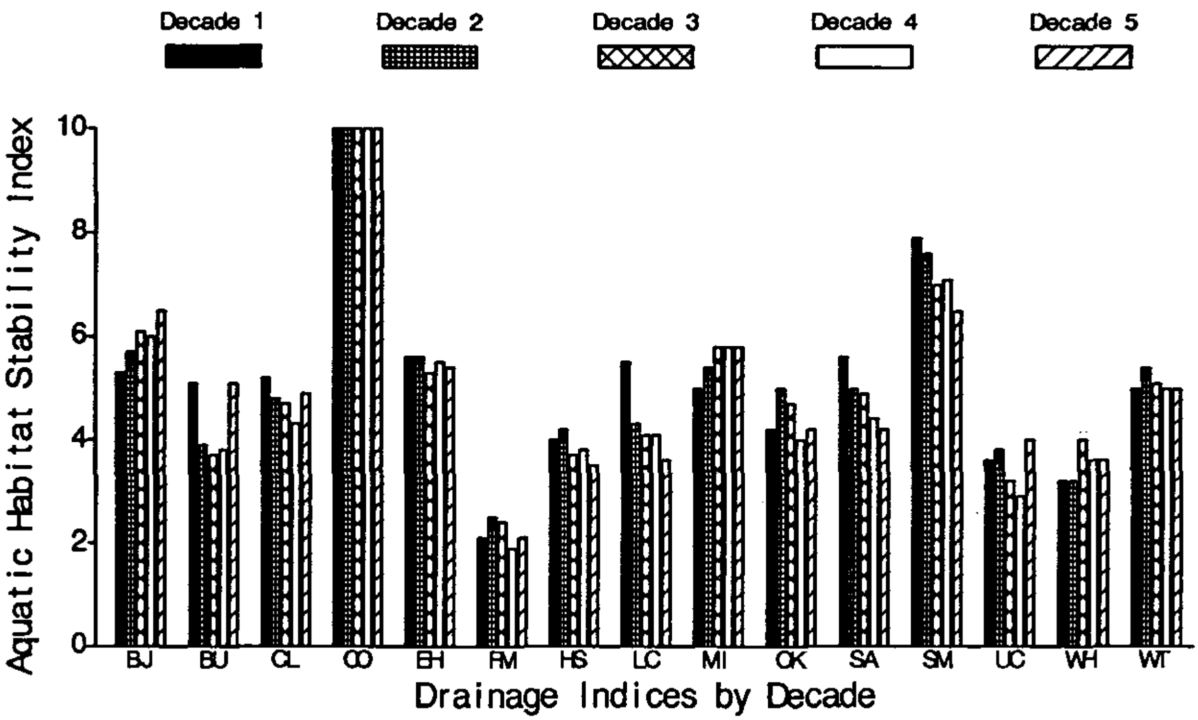


Figure IV-30d Alternative E

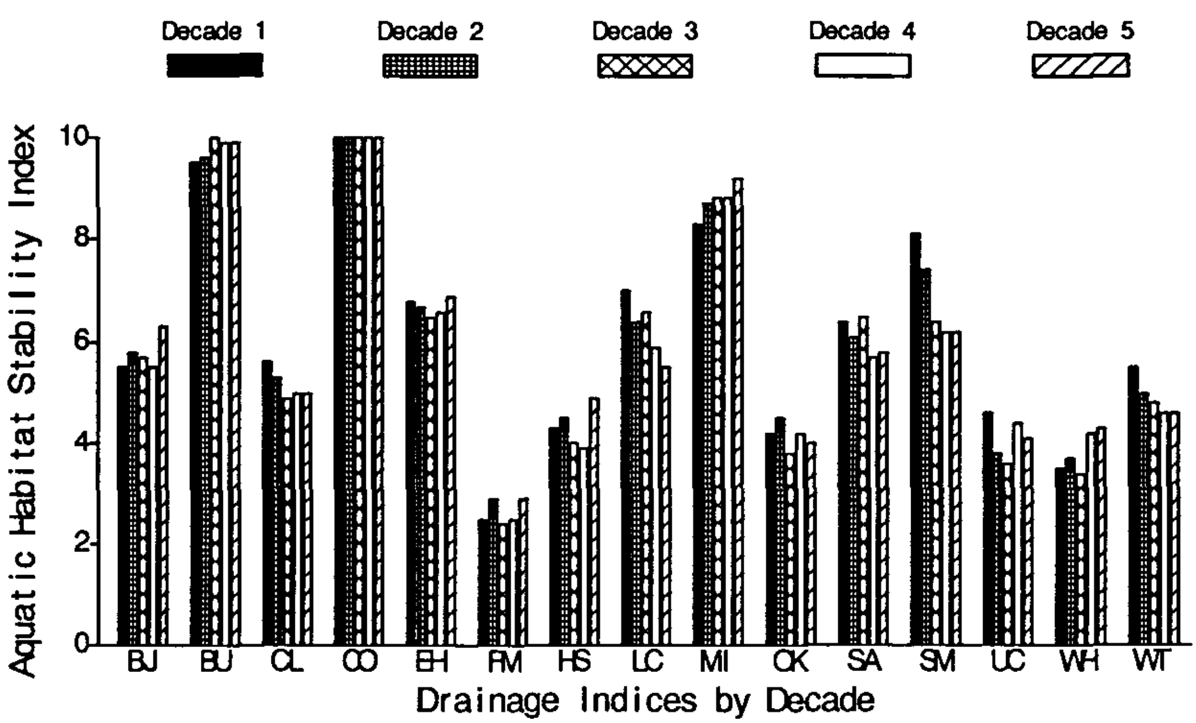


Figure IV-30e Alternative F

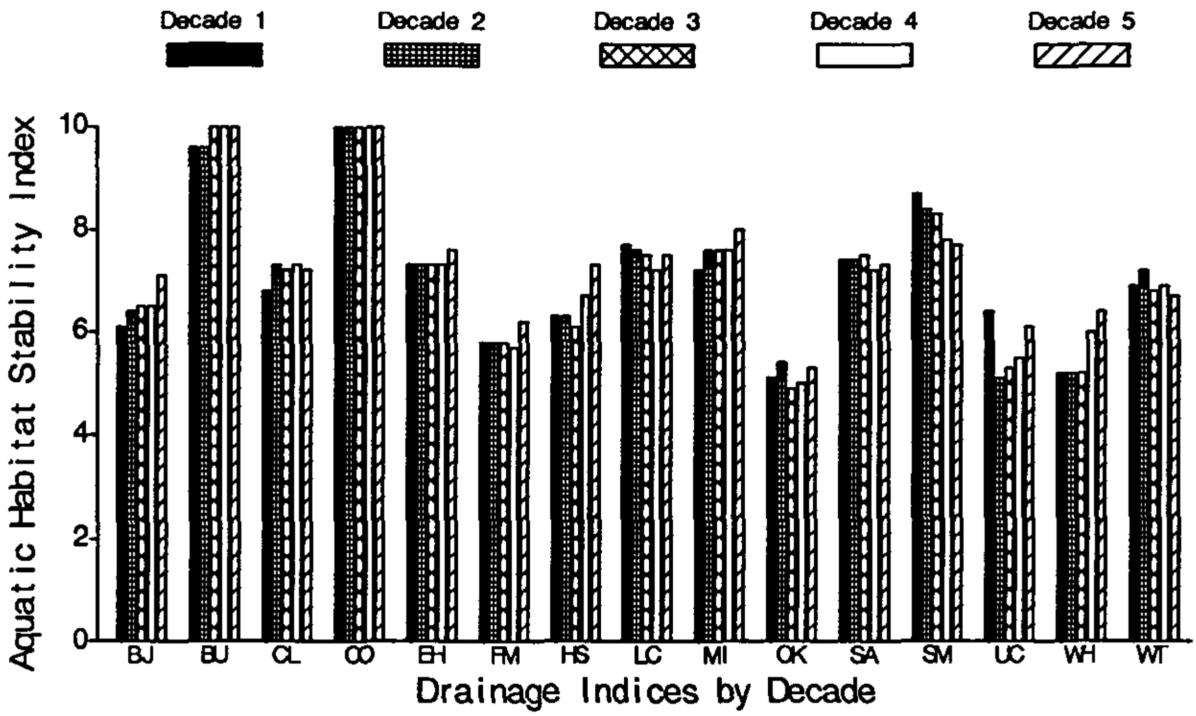


Figure IV-30f Alternative H

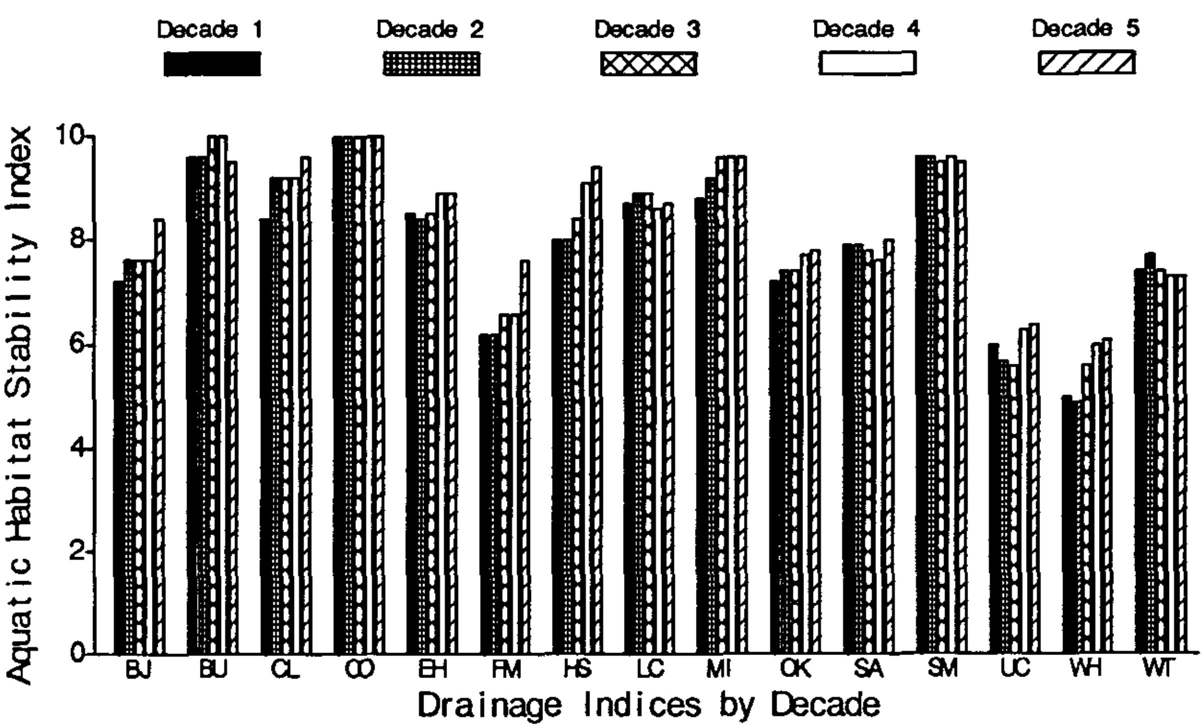


Figure IV-30g Alternative I

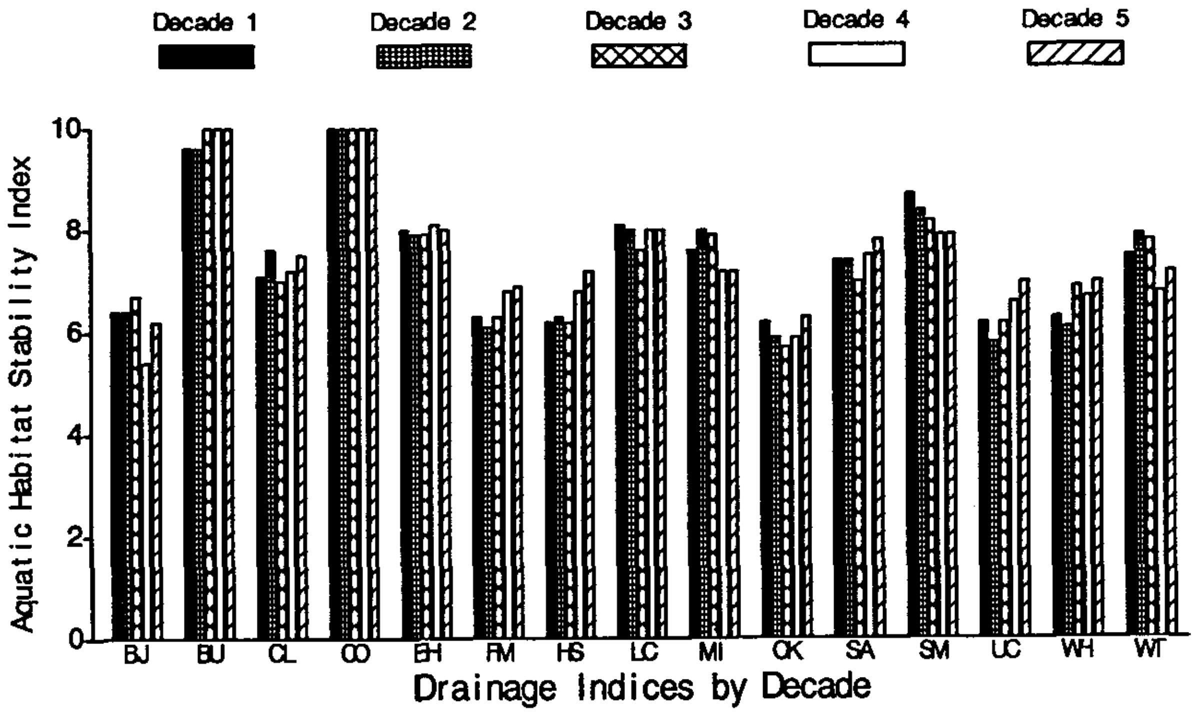


Figure IV-30h Alternative Q

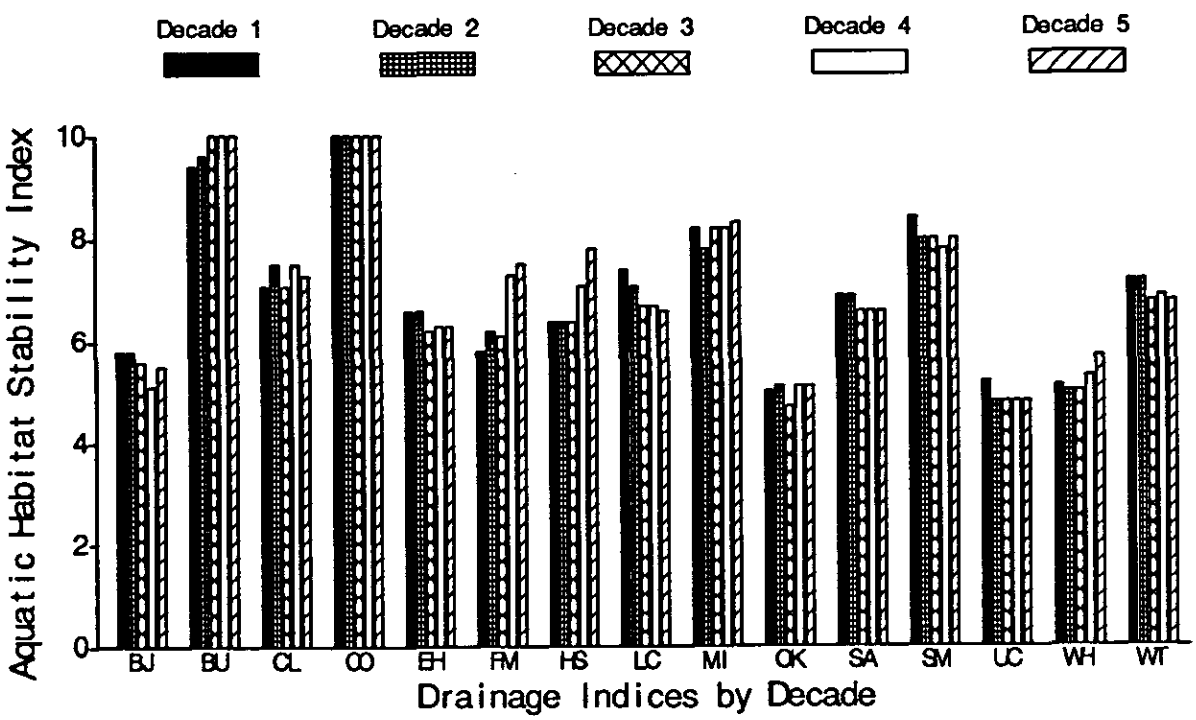
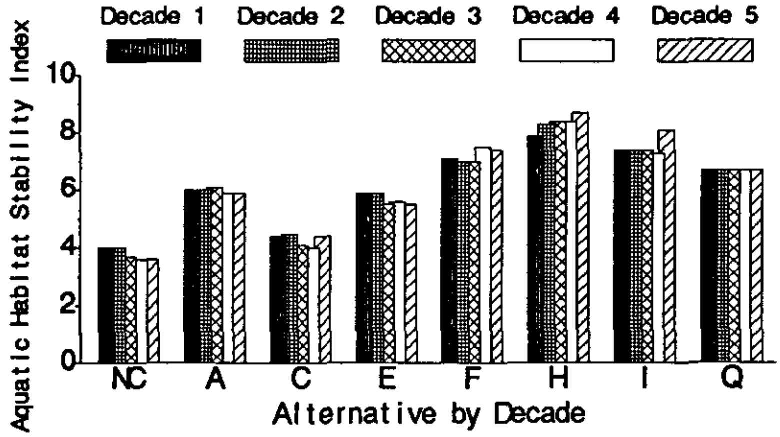


Figure IV-30i Forestwide Average Each Alternative by Decade



Alternative NC

Alternative NC provides no positive provisions for riparian area management other than excluding timber harvest on about 5,000 acres of unstable stream-adjacent slopes. As a result, land and vegetation disturbing activities will occur within the majority of riparian areas on the Forest. Intensive timber management would occur, unless a particular riparian area is included in a management area other than timber emphasis.

Near term results (decades 1-2) would result in very low to low stability of the aquatic habitat (Figure 2-10a). Relative adverse effects associated with episodic events such as flooding, will be increased and the ability of aquatic systems to recover will be reduced Forest-wide.

Long-term (5 decades), Forest-wide aquatic habitat capability would decline. The degree of decline will be controlled largely by the incidence of large episodic events such as floods, earthflow movements, etc. Such events, coupled with the increasingly altered condition of riparian areas would cause reductions in stream channel stability and complexity of aquatic habitat and increased sediment loads and summer stream temperatures. (Refer to the Water Component in this chapter for additional information on stream channels and riparian areas). Reductions in fish habitat capability, coupled with a general increase in recreation demand, may require such things as increased plantings of hatchery raised trout and anadromous fish by Oregon Department of Fish and Wildlife in order to regain and maintain habitat.

The effects will be greatest in the most unstable drainages (i.e. Fish Creek, Hot Springs Fork, and the Collawash River) and least in the Bull Run and Columbia Gorge tributaries. Cumulative effects in Fish and Memaloose Creek drainages would be significant declines in fish habitat capability. Mitigation effects would probably not be effective in substantially slowing the decline in stability in the most sensitive watersheds.

Rather large investments would be needed to partially rehabilitate riparian and aquatic areas most significantly affected by timber and road building activities. Due to overall reductions in watershed condition and aquatic habitat stability the efficiency and durability of these measures are likely to be reduced. Maintenance and replacement costs would occur rapidly as the number of rehabilitated sites increase.

Alternative A

The incorporation of management requirements in this alternative substantially alleviates concerns about future reductions in riparian resource conditions. Current plans provide minimal management emphasis for riparian areas and dependent resources. Management requirements include the explicit application of riparian management emphasis to approximately 119,850 acres. Included are riparian areas associated with perennial and fish-bearing streams, lakes, reservoirs, and wetlands. In addition, the Bull Run watershed is managed to maintain riparian resources as a necessary adjunct to the goal of providing high quality water to the City of Portland.

In the short term (decades 1-2) aquatic habitat stability is rated as low to moderate. Relative to other alternatives, amounts of harvest disturbance, increased sedimentation and extent of other riparian-compatible allocations are in the mid-range - more favorable than alternatives NC and C, and less favorable than alternatives such as F, H, I, and Q. Fish habitat capability would be maintained at about existing levels assuming "average" levels of natural disturbance, full implementation of mitigation measures, and a moderately aggressive program of watershed and aquatic habitat rehabilitation.

Long term aquatic habitat capability is estimated as stable. Even assuming extreme environmental events (episodic floods, blow down, etc.) aquatic habitat trends are rated as stable to slightly declining. The frequency and magnitude of these large scale events would control the ultimate direction of this trend.

Variations from average aquatic habitat conditions Forest-wide develop in two geographic areas. The Columbia and Bull run drainages would substantially exceed average conditions Forest-wide. However, four (Fish/Memaloose, Hot Springs Fork, Collawash, and Upper Clackamas) of the six drainages which make up the Clackamas River basin would reflect conditions more severe than those averaged Forest-wide. This situation could lead to greater reductions in habitat capability on Clackamas tributaries as well as reduced water quality on the mainstream Clackamas within and immediately adjacent to the Forest. The most likely effect is increased sedimentation reflected through more frequent and persistent periods of high turbidity. Reduced aquatic capability and lower water quality would reduce fishing opportunities especially in the spring and fall. Holding and rearing habitat for spring Chinook salmon, and holding habitat for summer steelhead on the mainstream of the Clackamas and Collowash Rivers may be reduced.

Alternative C

In the short term, aquatic habitat stability is rated low to very low. Riparian areas totalling 133,250 acres would be explicitly allocated for at the management requirement level. Short term benefits of the riparian allocations would be offset by relatively high levels of timber harvest, roading, sedimentation, and generally low levels of riparian-compatible land allocations.

Aquatic habitat capability would remain stable at current levels provided environmental conditions remain average, rehabilitation measures are extensive, and compliance with management requirements would provide the resiliency to recover from disturbances. Short term changes to environmental conditions due to periodic events such as moderate floods (10-year) are likely to occur.

This alternative is the only one that calls for intensive timber management in the Bull Run. Timber harvesting in the Bull Run would require more mitigation than presently indicated.

The Forest's primary objective for Bull Run is to maintain its exceptionally high quality of untreated water currently consumed by nearly 40% of Oregon's population. Water quality is now maintained by complying with the Water Quality Standards For Bull Run Watershed Management Unit in accordance with Bull Run Law PL 95-200, the Bull Run Unit Plan, and ongoing monitoring, agreements, and notations with the City of Portland representatives. Under this alternative, the risk of violating these standards would increase.

In the short term, maintenance of existing aquatic habitat conditions would be likely, provided natural disturbances are average and rehabilitation is relatively high. Extreme event conditions, however, would cause a decline in aquatic capability Forest-wide over the long term. This alternative has the highest adverse effects on aquatic resources except for alternative NC. Alternative C would reduce the aquatic habitat stability on all drainages except the Columbia River tributaries.

Alternative E

This alternative provides moderate to substantial improvements to riparian area and aquatic habitat management above base levels represented in Alternatives NC and C. It explicitly manages 36,300 acres for riparian management in addition to 74,050 acres within the Bull Run and 110,700 acres of riparian management requirements. The 36,300 acres includes the addition of 15 Key Site Riparian areas and two Special Emphasis areas: Miles Creek drainage and Still Creek watershed. Additional riparian benefits result from compatible management emphasis on relatively high amounts of other land. Moderate levels of aquatic habitat rehabilitation and enhancement are also provided.

In the short term, aquatic habitat stability is rated moderate to low. If environmental conditions remain average, and planned rehabilitation and enhancement investments are made, increases from 5 to 10% in the Forest's aquatic habitat capability may be anticipated by the second decade.

Long term, the trends in aquatic habitat are rated stable to slightly declining. This trend could well be improved based upon success in meeting standards and guidelines and the efficiency and durability of rehabilitation and enhancement measures.

If environmental events were extreme, trends in aquatic habitat conditions would become slightly to moderately declining. The frequency and magnitude of large scale environmental disturbances would influence the ultimate direction of this trend.

Variations from average aquatic conditions Forest-wide occur in eight of fifteen drainages. Substantially better conditions are projected in Columbia, Bull Run, Salmon, East Fork Hood River, and Lower Clackamas drainages. Less than average conditions are projected in Fish/Memaloose, Hot Springs, White River, Oak Grove, and Upper Clackamas drainages. Moderate reductions in fish habitat capability on Fish/Memaloose are predicted. Slight reductions in rearing areas for resident trout off the Forest due to increased stream temperatures would be possible in the White River drainage. Similarly minor reductions are possible on the upper mainstem Clackamas and associated upper basin tributaries.

Alternative F

This alternative provides major and positive opportunities for aquatic habitat management. It calls for more major increases in the number and acreage of areas emphasizing riparian management, as well as other compatible management activities, than any other alternative except H, I, and Q. Above the base level, this alternative adds more than 11,300 acres of Key Site Riparian areas, and 46,150 acres of Special Emphasis areas.

In the short term, aquatic stability would be rated moderate to high. General improvement in aquatic conditions is projected through natural recovery of previously disturbed areas. Additional improvements would occur through annual investments for both habitat rehabilitation and enhancement.

Long term, the trends in aquatic conditions would show general improvement across the entire Forest. Major factors would include natural recovery of previously disturbed areas, rehabilitation and enhancement, and a high percentage of complementary land allocations. Even if extreme event conditions were to occur, improving aquatic trends would be expected to persist.

Variations from average aquatic conditions Forest-wide occur in eight of fifteen drainages. Substantially better conditions are projected in Columbia, Bull Run, and Salmon drainages. Less than average conditions are projected in Fish/Memaloose, Hot Springs, White River, Oak Grove, and Upper Clackamas drainages.

Alternative H

This alternative provides the greatest management opportunities for riparian areas and aquatic habitat management, similar to those discussed for Alternative F and I. Relatively large amounts of land, in riparian-compatible allocations are incorporated.

Existing old-growth habitat conditions would be preserved in riparian areas. This alternative's short term aquatic stability would be rated high. Relative levels of timber harvest and accelerated sediment delivery would be lower than any alternative except I. Under average environmental conditions, this alternative projects general improvements in aquatic habitat conditions and habitat capability.

Long term, the trends show general improvement in aquatic conditions throughout the Forest. Contributing factors were discussed in Alternative F. Given extreme event conditions, improving trends would continue although at somewhat reduced levels.

Variations from the Forest's average aquatic conditions are projected for nine of fifteen drainages. Substantially better conditions would be found in Columbia, Bull Run, and Salmon River drainages. Slightly better conditions would be likely in Miles Creek, Badger/Jordan, White River, Lower Clackamas, Hot Springs Fork, and the Collowash. Even in these six drainages, however, short term aquatic stability would rate as moderate, and long term trends would be stable to improving.

Alternative I

This alternative, like F, includes major and positive land allocations compatible with riparian-area management. High levels of investment would eliminate the Forest's backlog of rehabilitation and fully implement the aquatic enhancement program. Substantial increases in smolt and legal trout habitat capability would become evident by the second decade and persist through the analysis period.

In the short term, aquatic stability rates very high. Under average environmental conditions, previously disturbed areas would recover quite rapidly and conditions would improve at corresponding rates. Investments in rehabilitation and habitat enhancement would improve watershed conditions and habitat capability.

Long term trends in aquatic conditions would show substantial improvement. Total increases in habitat capability are likely to exceed 15% throughout the Forest. Trends across the Forest, if subjected to extreme environmental disturbances, would nevertheless continue to improve. This relates to the projected high stability and resiliency of the riparian-aquatic system.

Nine of fifteen drainages would deviate from general aquatic conditions currently prevailing throughout the Forest. Most would show substantially better conditions, including Columbia, Bull Run, Salmon River, Lower Clackamas, Fish Creek, Hot Springs Fork, and Collowash. Areas with conditions slightly better than the current state would be found on the Oak Grove Fork and Upper Clackamas drainages. On these two drainages, this would imply a short term aquatic stability rating of high/stable to slightly improving long term trends.

Alternative Q

This alternative also provides major and positive opportunities for aquatic habitat management. It calls for increases in the number and acreage of areas emphasizing riparian management, as well as other compatible management activities, than any other alternative except F, H, and I. Above the base level, this alternative adds more than 16,000 acres of Key Site Riparian areas and 78,600 acres of Special Emphasis Watersheds.

In the short term, aquatic stability would be rated moderate to high. Inclusion of the inerently sensitive drainages into the Special Emphasis Watersheds category makes this alternative a substantial improvement over NC, A, C and E. On the ground these areas will have opportunity to recover from past management and natural events. General improvement in aquatic conditions is projected through rehabilitation and natural recovery of previously distrubed areas. Additional improvements could occur through annual investments for both habitat rehabilitation and enhancement.

Long term, the trends for aquatic habitat are projected to be slightly to moderately improving across the Forest. Conditions resulting from extreme environmental events would produce unchanged to slightly declining trends in aquatic habitat stability. Long term trends would be strongly influenced by three factors:

- Operational efficiency in meeting riparian standards
- Success in rehabilitation and enhancement
- The frequency and magnitude of large-scale environmental disturbances

Nine of fifteen drainages are projected to diviate from general aquatic conditions currently prevailing throughout the Forest. Most show substantially better conditions, including Columbia, Bull Run, Salmon River, Lower Clackamas, Fish Creek, Hot Springs Fork, and Collowash. Areas with slightly better conditions would be found on the Oak Grove Fork, White River, and Upper Clackamas drainages. On these three drainages, this would imply a short term aquatic stability rating of moderate with stable to slightly improving long term trends.

Cumulative Effects of the Alternatives on Aquatic Resources

Background

This discussion of the alternatives' impacts on aquatic habitats incorporates a number of variables as a method of estimating future habitat trends and conditions. The process has been designed to describe cumulative effects to aquatic habitats on the Forest. This level of analysis appears adequate for most of the Forest's river basins and drainages based on professional judgement that identifiable, off-the-Forest effects would not be felt in most areas. Two river basins, however, cannot be included in that level of analysis. These are Fifteenmile Creek and White River. Climate and the uses of land in these two areas create special conditions in which water quality and fish habitat off the Forest could be sensitive to Forest management activities.

Fifteenmile Creek is a direct tributary of the Columbia River. Roughly 60 to 70 percent of the drainage is privately owned and used primarily for dry land wheat production. This basin supports the easternmost run of wild winter steelhead trout in Oregon. The run is at severely depressed levels due to reductions in available rearing habitat. The cause of these reductions appears to be a combination of lethally warm water temperatures in the summer, excessive sedimentation, and severely reduced summer stream flows. A limited portion of the total basin on or immediately adjacent to the Forest appears to be the primary source of existing steelhead reproduction and growth. Suitable habitat conditions exist in this area and they are believed strongly linked to the generally favorable water quality associated with the Forest's streams. If water quality or habitat were to be reduced on the Forest, the likely result would be the effect of a substantial lowering in water quality and steelhead habitat off the Forest.

The White River is a direct tributary of the Deschutes River. About 60% of its drainage is in public ownership, and the majority of this holding is in lands of the National Forest System. Privately owned lands are used mainly to support livestock, dry land and irrigated farming, and timber production. Irrigation from up-river tributaries supports much of the agricultural activity.

Most of the larger streams in this basin support populations of resident trout. At least three unique populations of wild rainbow trout are found in these waters. The White River Feasibility Report, 1985, states that anadromous fisheries could be introduced into the basin without negative effects on resident fish.

Water quality in the upper basin is generally good. Periodically, however, high levels of suspended sediment are delivered into the White River mainstem due to glacial melt. Conditions in the lower mainstem and its major tributaries, Rock Creek, Threemile, Badger, and Tygh Creek, show very high summer stream temperatures reaching to 25 degrees C (77 degrees F), often accompanied by increased sedimentation. These adverse conditions appear to be intensified by up-stream irrigation which reduces the main streamflows. Changes in upstream water quality are likely to further aggravate existing problems downstream. Available rearing areas and actual basin production for resident trout or anadromous species may be severely endangered.

Assessments of cumulative downstream effects are based on continuation of known land use practices on all lands other than the National Forest. Plans for comprehensive habitat restoration have been approved for Fifteenmile Creek and are possible on White River as part of the Northwest Power Planning Council's Columbia Basin Fish and Wildlife Program, but details of the extent and probable effectiveness of this work are not known at this time.

In general, increased stream temperatures and sedimentation are the main sources of off-the-Forest cumulative effect changes in water quality and fish habitat. These changes could be within acceptable limits on the Forest, if present conditions are assumed to continue, but they could also result in an increase in streams with unacceptable conditions for fish off the Forest. This risk is associated with all eight alternatives although its probability would vary substantially between basins by alternative and by time spans. Figures II-10a-g show the relative risks of adverse cumulative effects by alternatives and drainage by decade.

In some areas, cattle may damage stream banks by trampling and breaking down the banks. Stream temperatures could increase due to bank slippage and cropping streamside vegetation. The natural habits of cattle can cause a problem with water quality. When their manure enters the water, it causes an increased demand for biological oxygen. Oxygen needed by aquatic animals, including fish, would be reduced because it is used to break down the cattle's organic material. Trout are especially sensitive to any decrease in oxygen levels in the water. Considering the Forest on the whole, however, and the potential that water quality may be affected in streams flowing through grazing allotments, riparian areas, water quality, and fisheries would not be greatly affected by grazing.

Mitigation Measures

The three mitigation measures of greatest significance are:

- Specific management direction for riparian-dependent resource management
- Forest-wide standards and guidelines for fish, water, and riparian resources
- An array of rehabilitation and/or enhancement techniques.

These measures are incorporated in various combinations depending on the theme of a particular alternative. Management requirements provide general riparian management of all Class I, II and III streams, lakes, reservoirs and wetlands. In addition, important Key Site Riparian Habitat management areas are located on the mainstems of Fifteenmile Creek (lower,) White River (upper), Badger Creek (lower), Boulder Creek (upper), Gate Creek (lower), and Clear Creek (upper) in every alternative but NC.

As a general rule, alternatives with the lowest relative acreage in riparian management areas (i.e., C) include the highest levels of riparian rehabilitation. Alternatives with the highest riparian management levels (i.e., A, E, Q, F, H, and I) will employ rehabilitation measures as well as increasing measures for enhancement. Alternatives A, F, E, Q, H and I apply Special Emphasis riparian management to the entire Miles Creek drainage.

Table IV-17 Aquatic Habitat Stability Index by Alternative Forestwide Summary

	Alternative							
	NC	A	C	E	F	H	I	Q
Fifteen Mile Creek Basin	High	High	High	Low	Low	Low	Low	Low
White River Basin	High	High	High	High	Moderate	Low/ Moderate	Low	Moderate

Key: H- High probability; M- Medium probability; L- Low probability

This emphasis is to facilitate positive management of riparian-dependent resources such as water and fish. Alternatives F, H, and I apply Special Emphasis riparian management to selected streams in the White River basin. Additional Key Site Riparian allocations are incorporated in both Fifteenmile Creek and White River basins.

Additional mitigation can be used to reduce effects of disturbing activities on riparian areas and aquatic habitats. Two general groups of measures have been recognized:

- Measures or operational practices applied during project planning and/or implementation to reduce undesired impacts.
- Post-project activities designed to accelerate restoration of desired habitat conditions or attributes.

Since the measures in the first group are designed to avoid unnecessary levels of disturbance, they receive the highest priority. When they are applied successfully, they reduce or avoid the need for post-project investments to repair the damage or rehabilitate the resource. Many of these practices are described in the accompanying Table IV-18 which summarizes some of the most common measures by major resource management area.

Fencing is very effective in mitigating impacts from livestock grazing. The achievement of uniform distribution of livestock has had good results as a method of mitigating impacts to riparian areas.

Measures in the second group include projects designed to restore or speed restoration of desired riparian and/or aquatic habitat conditions. These projects usually require added costs for reconnaissance, planning, implementation, and maintenance. Frequently they attempt to mimic natural conditions and therefore require different periods of time (one to ten years) to reach full effectiveness. The long term efficiency and durability of common rehabilitation applications (15 to 30 years) have not been fully evaluated for conditions found on the forest. Monitoring individual projects over limited time, such as one to five years, indicates generally good success, that is, more than 70% effectiveness.. Conditions commonly encountered and measures to mitigate them are summarized in Table IV-18.

Effectiveness of Mitigation

The effectiveness of mitigation of impacts on aquatic resources can be divided into two areas:

- Measures applied during project planning and implementation to prevent impacts.
- Rehabilitation measures applied after an impact has occurred.

Table IV-18 Measures Applied During Project Planning and Implementation to Mitigate Riparian Area Effects Related to Selected Management Activities

Condition to Rehabilitate	Nonstructural Measures	Structural Measures
Riparian Habitat	Vegetation planting Removal of selected vegetation Underburning	Excavate ponds, channels Road/trail gating/closure Nest boxes
Channel Structure/Aquatic Habitat Complexity	Introductions of large woody debris Gravel placement Removal of fills constricting channel Vegetation planting	Log sill, deflectors, wings Gabion installation Boulder placement Pond/side channel development Lake outlet control Large woody material placement Bank stabilization (riprap, etc.)
Exposed/Compacted Soils	Vegetation planting Ripping/scarification Mulching	Special drainage structure Water bars Check dams Fencing Ripping and revegetation
Fish Passage	Remove blockage	Fish ladder Baffles Jump pools Log jam modification

If properly planned, designed, and administered, effectiveness is generally very high for most measures in the first group. Techniques such as full suspension of logs, leave strips along streams, use of temporary roads, access control to limit recreation use, and fencing to exclude stock have proven very effective in avoiding adverse impacts.

Mitigation measures in the second group are also very effective, but are essentially restorative in character, and involve attempts to repair damage to the aquatic ecosystem. Rehabilitation does not really "fix" a damaged ecosystem, it simply hastens recovery.

Measures such as replacing lost channel structure and restoring pool habitat involve placement of structures. Since stream channels are dynamic in nature, flood events tend to remove these structures. The Forest has been successful in designing instream structures that improve habitat and that are both effective and durable. A recent study (Forsgren, 1986) looked at over 600 habitat improvement structures after a 15 to 25 year flood event. Over 90% of these structures were still functioning.

The effectiveness of the mitigation measures discussed will be monitored through a network of sample stream reaches and sites, through fish counts and through monitoring of specific management activities.

Potential Conflicts with Plans and Policies of Other Jurisdictions

Please refer to the end of this chapter for a discussion of the possibility of conflicts between the alternatives and the plans and policies of other jurisdictions with responsibility or authority for this environmental component.

Wildlife

Significant Interactions

Wildlife interacts with a wide spectrum of other resources, particularly recreation. Undeveloped recreation does not generally have a major effect on wildlife resources. However, developed recreations sites, trail construction, or dispersed activities, such as ORV use or hunting, can have effects on localized wildlife communities. Harassment, limitation on access, or habitat loss are of concern at these sites. Deer and elk often benefit from the small, dispersed openings which are characteristic of Wildlife/Visual Areas.

Timber management activities have significant effects on wildlife. Timber management activities can directly affect many animals which frequent mature or old growth forest. Spotted owls, pileated woodpeckers and pine martens represent those species of wildlife dependant upon old growth/mature habitat. As stands with these characteristics are harvested and brought under intensive management, spotted owl, pileated woodpecker and pine marten habitat will diminish. Timber management activities may improve the quantity of food resources for black-tail deer, Roosevelt elk, and game birds.

In managed timber stands Standards and Guidelines are used to insure that cavity nesters will be maintained Forestwide at a minimum of 40 percent of their biological potential. Where new timber harvest units occur, wildlife trees can be maintained in sufficient quantity and quality to support at least 60 percent of the maximum biological potential of primary cavity nesting species.

Roads used to access timber harvest areas also allow the public greater access to the Forest and provide increased opportunities for human and wildlife interactions. Although roads also provide travelways for wildlife, roads which remain open may result in increased wildlife mortality, through legal or illegal means. Wildlife and wildlife habitat is disturbed by new road construction. This activity displaces one population segment into the territory of another, resulting in increased competition for space cover and forage (Brown 1985). Road building also results in a direct loss of wildlife habitat.

The suitability of vegetative cover for wildlife is modified by the amount of roads open to the public. The effectiveness of wildlife hiding cover is reduced by an increase in roads and road use. Specific roads can be closed to protect wildlife travel corridors or hiding cover. Closed roads can be seeded to provide additional forage. Seeded cut and fill slopes provide some forage for wildlife. Deer and elk use of otherwise suitable feeding and resting areas is reduced adjacent to open primary and secondary roads (Brown 1985).

Mining activities may affect wildlife needs. Wildlife habitats may be modified or destroyed and species distribution influenced. Wildlife may be exposed to toxic substances used or uncovered during mining activities. Vehicle use and other mining activities produce noise, which may affect feeding, migration, breeding and other wildlife activities. Reclamation may create additional forage areas and wildlife sighting opportunities.

Direct interactions between fire and wildlife populations vary widely. While some evidence of vertebrate mortality has been reported, instances of mortality are usually negligible. Population levels may decrease because the individuals or their eggs are killed, or their food supply or shelter are diminished. In some instances, populations of some species which are attracted to heat, smoke or damaged trees may increase during and after the fire. Interactions with invertebrate populations may be short-term or long-lasting.

Loss of suitable habitat is usually the limiting factor in the recovery of threatened and endangered species. Catastrophic fires may have a long term deleterious effect on threatened, endangered, or sensitive species by removing suitable habitat at an extremely high rate.

The immediate post-fire environment presents all terrestrial wildlife with a sudden and drastic modification of habitat structure and local microclimates. This may have positive or negative influences depending on the species involved. Long term influence of post-fire vegetation succession on wildlife populations cannot be generalized. Vegetation growth and change provide the driving force for a dynamic system in which some species are favored, while others are not (Lyon et al. 1978 [See Siskiyou EIS list of references]).

Land allocations can dramatically affect wildlife populations. The intent of designated wildlife habitat and special wildlife site management areas is to maintain animal populations dependent on habitats which are scarce or diminishing as different areas of the Forest are brought into managed rotation. The description and size of each wildlife management area is included in the description of alternatives (Chapter II). Permitted activities and mitigation measures for each Management Area are included in Standards and Guidelines (Forest Plan, Chapter IV).

Timber management activities affect habitat quality for deer and elk. There are four major factors that influence deer and elk habitat capability: sizing and spacing of forage, quality of cover, quality of forage, and road density. Activities that alter the amount and arrangement of forage, hiding, and thermal cover, or alter the amount of grass, forbs and brush may either increase or decrease habitat capability, depending upon level and placement of activities (see the Vegetative component of this chapter).

In a given subdrainage, maintaining optimal proportions of thermal cover to forage is critical for providing an even flow of forage and avoiding drastic reductions of either forage or thermal cover throughout the timber harvest rotation.

Forage is influenced by the removal of tree canopies which allows light to penetrate to the forest floor, favoring the growth of forbs, grasses and shrubs. Regeneration harvest provides the greatest amount of forage. However, in winter these areas may not be used due to deep snow. Therefore, maintaining high quality and quantity of forage within thermal cover is critical. The primary limiting factor on the Forest that determines deer and elk populations on winter range is usable forage adjacent to or within thermal cover. Habitat improvement activities such as seeding, planting, fertilization and wetland development also increase forage quality and quantity.

Roads built for timber harvest activities affect deer and elk. Although this allows the public greater access to wildlife, there are stress effects to deer and elk populations associated with high road densities. Increased vehicle access results in increased vulnerability of animals to both legal and illegal harvest. Deer and elk are also disturbed by vehicular traffic. Disturbance, especially during the critical winter and fawning/calving periods can result in increased mortality. Road closures are an effective method to increase deer and elk habitat capability.

Environmental Effects and Mitigation

Overview

The management objective for wildlife resources is to provide habitat capable of indefinitely supporting all native and desirable nonnative wildlife species. All alternatives (except NC) are designed to meet this objective at least at minimal levels. Alternatives that allocate relatively large amounts of land for preservation of specific wildlife resources result in better long-term protection. Alternatives that allocate land to categories such as Wilderness (A-2) also result (de facto) in protection of old growth and wildlife resources. Alternatives with lower timber harvests also have fewer roads; this generally means less potential disturbance to wildlife in general.

All alternatives, except the NC , are designed to provide for a mix of habitats capable of sustaining all species at minimum viable population levels or higher over the long term. (See Chapter II for a discussion of Management Requirements (MR).) The objective of wildlife MRs is to ensure that viable populations of all species will be distributed throughout the Mt. Hood. All alternatives, except NC, contain MRs.

Some alternatives preserve significantly more wildlife habitat with old growth characteristics than others. In all alternatives, except H, this habitat type will gradually diminish and by the fifth decade will be greatly reduced in commodity-oriented alternatives. Alternative H protects a significantly larger amount of wildlife habitat with old growth characteristics than the other alternatives. Alternatives H and I provide for increased mature and old forest protection through increased SOHA number and size.

Each alternative has a different potential for deer and elk habitat capability. In some alternatives, winter range will be optimized for deer and elk. In all alternatives, projects such as creation of permanent meadows, forage seeding and road closures would occur but the amount differs by alternative.

At least half of eagle and peregrine falcon habitat is protected in Category A lands in all alternatives. A specific land allocation for bald eagles is included in only half of the alternatives, however.

All alternatives contain land allocations for special wildlife habitats not represented by indicator species. More riparian habitat, hardwood stands, meadows, and other special sites receive specific land allocations in some alternatives than in others.

All alternatives provide for capital investment in wildlife habitat improvement projects through implementation of all or part of the Forest's Comprehensive Fish and Wildlife Plan (Sikes Act--Public Law 93-452) plus Knutson-Vandenberg) projects. If funding is made available to implement wildlife habitat improvement projects identified in the Activity Schedule, total habitat capability would increase for many species.

Wildlife can be managed on the Forest in two ways, by protection and by standards. Protection involves specific land allocations such as pine marten and pileated woodpecker management areas. In other areas, such as timber emphasis areas, Forest-wide Standards and Guidelines for wildlife resources will guide timber management, road building, mining, and livestock grazing.

The management objective for deer and elk is to provide habitat capable of indefinitely supporting these species. All alternatives are designed to meet this objective in at least a minimally adequate fashion. Alternatives which provide specific standards and guidelines as well as deer and elk emphasis land allocations result in the best long term management. Alternatives with lower timber harvests have fewer roads, which result in less disturbance to deer and elk and thus higher habitat capability. Alternatives that maintain quality thermal cover, particularly in winter range, would also result in better long term protection.

Some alternatives provide for more old-growth habitat. This habitat will gradually diminish and by Decade 5 would be greatly reduced in Alternatives NC, A and C. Loss of old-growth equates to loss of optimal thermal cover, which would decrease habitat capability for deer and elk, especially when significant loss of optimal cover occurs within winter range. There is a subsequent increase in deer and elk forage with this loss of old-growth. However, this forage does not compensate for the lack of thermal cover, especially within winter range..

All alternatives provide for various habitat improvement projects through implementation of the Sikes Act (Public Law 93-452) as well as K-V (Knutson-Vandenburg) projects. Implementation of habitat improvement projects would increase deer and elk habitat capability. More projects may also be done if alternative funding sources are available.

Standards and Guidelines are designed to ameliorate major adverse consequences of the alternatives. Some alternatives are specifically designed to optimize wildlife habitat throughout the Forest. However, many habitat changes can only be partially mitigated. Under at least half of the alternatives old growth habitat for cavity nesters, pine martens, pileated woodpeckers and spotted owls will decline. Thermal cover for deer and elk will also remain low or decline under several of the alternatives.

In all alternatives threatened and endangered species will be protected as required under the Endangered Species Act. In some alternatives, greater emphasis is placed on protecting additional habitat.

Spotted owl nests and roosting sites found outside designated Spotted Owl Habitat Areas (in areas managed for timber production) may be protected through consultation with the US Fish and Wildlife Service, or through the Forest-wide Standards and Guidelines (Chapter IV, Forest Plan). Designated SOHAs, as well as management areas in Wilderness and other reserved lands, will be monitored to determine pair occupancy and reproductive status. General population trends for spotted owls can be determined by monitoring Random Sample Areas across the Forest. The Forest will maintain the flexibility to manipulate the Spotted Owl Network in response to the information gathered through monitoring of the management and random sites, as well as catastrophic events.

Standards and guidelines provide necessary provisions to offset major adverse consequences of the alternatives. However, alternatives NC, A, and C do not include standards and guidelines specific to deer and elk, therefore habitat alterations can only be partially mitigated. The amount of thermal cover would be substantially reduced under most alternatives. This can not be mitigated for in winter range, especially habitat alterations that reduce the amount of thermal cover to below optimal levels. This would result in decreased habitat capability.

Table IV-19 Management Requirements for Pine Marten, Pileated Woodpecker, and Northern Spotted Owl Management Areas*

Habitat Parameter	Pine Marten	Pileated Woodpecker	Northern Spotted Owl
Successional stages required	Mature or Old Gorwth	Mature or Old Growth	Old Growth or Mature
Acres/Habitat Area in Mature/Old Growth Forest	160 acre/habitat are (represents territory of 1 female and part of territory of 1 male).	300 acre/pair (within a 1,000 acre unit, which also includes 300 acres of feeding habitat).	1,500 acres/pair (habitat must be within 1.5 miles of core center).
Canopy Closure too high	50 percent or greater		Moderate
Minimum Habitat Block Size	160 acres	300 acres	300 acres in nesting core, 60 acres in other habitat.
Maximum Dispersal Distance Between Habitat Areas	One habitat area for every 4,000 to 5,000 acres (area of circle with diameter of 3 miles).	One habitat area for every 12,000 to 13,000 acres (area of circle with diameter of 5 miles).	6 miles between single pairs, miles between groups of 3 or pairs, edge to edge.
Snag Maintenance Requirements in Habitat Areas	Maintain minimum average of 2 hard snags/acre >12" DBH; 24 of the 320 snags should be >20" DBH.	Maintain minimum average of 2 hard snags/acres >12" DBH, within the 300 M/OG area; 45 of the 600 snags should be >25" DBH; within the 300 acres for feeding, maintain minimum average of 2 hard snags/acre >10" DBH.	Must meet requirements for pileated woodpecker; should have dead standing trees and fallen decayed trees to support abundant populations of prey species, especially northern flying squirrel and woodrat.
Down Timber Requirements	Minimum average of 6 down logs/acre >12" DBH and 20' long.	Must meet requirements for marten.	Must meet requirements for marten.

* *Habitat within each area should be as contiguous as possible.*

The above table (IV-19) shows the management requirements for Pine Marten, Pileated Woodpecker, and Northern Spotted Owl.

The table on the following page (IV-20) shows the number of acres of land allocation types by Alternative for Merriam's turkey and silver-gray squirrel habitat.

Related ICOs

- Viable populations of spotted owls and management indicator species.
- Deer and elk management.
- Procedures to protect Threatened and Endangered Species.
- The need to provide key habitats for indicator wildlife species.
- Use of vegetative management to maintain or improve representative habitat for plant and animal communities.
- Implement initiatives and partnerships relating to wildlife recovery and education.

Table IV-20 Number of Acres of A, B, and C Land Allocations by Alternative Within the Merriams Turkey and Silver-Gray Squirrel Habitat

Land Allocation	Alternative							
	NC	A	C	E	F	H	I	Q (Preferred)
A[1]	3,502	6,063	3,474	8,002	8,667	56,003	14,244	16,029
B4				18,885	28,709	20,855	37,887	22,616
B[2]	27,681	26,118	2,552	48,102	62,237	39,384	83,158	59,601
C1	102,910	101,916	128,106	59,409	34,677	18,058	0	36,041
Total	134,094	134,097	134,132	134,399	134,291	134,300	134,289	134,296

[1] *Includes land allocations A2, A3, A4, A5, A6, A7, A8, A9, 12*
[2] *Includes land allocations B1, B2, B3, B9, B10, B11*

Alternative NC

Direct and Indirect Effects

This alternative will not provide for the long-term viability of many wildlife populations. NFMA MR's are not incorporated into this alternative.

This alternative does not supply sufficient amounts of habitat to maintain viable populations of pileated woodpeckers, pine martens, and spotted owls. Management Requirements for pileated woodpecker, pine marten, and spotted owls and the species they represent are not met in this alternative. Approximately 45 percent of the suitable pileated woodpecker/pine marten habitat is in commercial forest land. These percentages do not take into account recruitment of younger stands.

During the first decade suitable habitat exists for 670 habitat areas for pileated woodpecker and 979 for pine marten. By the beginning of the second decade these habitat areas will decrease to 620 and 920 for pileated woodpecker and pine marten, respectively. By the fifth decade the numbers will decrease to 498 and 753.

Approximately 48 percent of the suitable spotted owl habitat will be allocated as Commercial Forest Land, and managed for timber production, with an additional 19% falling into lands with reduced yields ("B" lands). Spotted owl habitat will be decreased from current levels by 13 percent by the end of Decade 2, and 31 percent by the end of the 5th Decade due to timber harvest. The percentages do not take into account recruitment of younger stands. This will correspond to a decrease in habitat capability over the 50 year time frame from 180 pairs down to 124 pairs. Additional protection of some old habitat would be provided for through the designation "A" lands . Total amount of protected lands on the Forest would amount to approximately 340,000. Of that total, approximately 200,000 acres are currently considered as suitable habitat. This amount includes the Columbia Gorge National Scenic Area, and the Bull Run Watershed Management Area, which account for about 83,000 acres of the suitable habitat total. This alternative will provide for the least amount of protection of suitable pileated woodpecker, pine marten and spotted owl habitat outside of designated MRs.

The health and abundance of Merriam's turkey and silver-gray squirrel are dependant upon the ponderosa pine/Oregon white oak habitat found on the Eastern portion of the Forest. Approximately 134,000 acres of suitable turkey and squirrel habitat has been identified. The Oregon Department of Fish and Wildlife estimates that there are approximately 2200 Merriams turkey and 2200 silver-gray squirrel on the Forest. For decades 1, 2 and 5 turkey populations are estimated at 2200, 3800 and 3700, squirrel at 2200, 4100 and 4000, respectively.

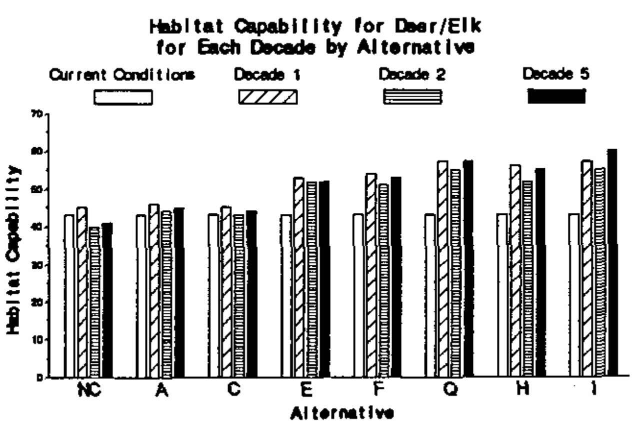
Under the NC alternative there are no standards for management of the pine/oak habitat. Only those areas currently designated as wilderness would be protected. Seventy-seven percent of this habitat would be managed for timber under this alternative.

Approximately 174,000 acres of suitable habitat has been identified on the Forest for bald eagle and peregrine falcon. Under this alternative, approximately 90,000 acres would have no scheduled harvest, 40,000 reduced harvest and 44,000 would be on commercial forest land. Like Alternatives A and C, the NC alternative provides little protection for bald eagles and peregrine falcons. The advantage to the NC alternative over the other two alternatives is the inclusion of a specific land allocation for bald eagles (A-13).

Alternative NC continues managing under the Forest's existing plan. There would be no Forest-wide standards and guidelines for deer and elk. Timber harvest would continue without restriction in winter range and there would be low emphasis on habitat improvement projects. The amount of critical thermal cover in winter range would drop below minimum conditions necessary for deer and elk.

18 percent of the Forest (201,497 acres) would be managed for timber harvest by the 5th decade (approximately 3.6% of the Forest per decade), therefore a sustained supply of forage for deer and elk would be provided. Average opening size would substantially increase which would equate to less quality forage available for deer and elk. Number of roads would decrease and amount of thermal cover would decrease. Overall habitat capability would increase slightly in the 1st decade but would decrease by 5% and theoretically support 14,100 deer and 4,100 elk by the 5th decade (Figure IV-31).

Figure IV-31 Habitat Capability for Deer/Elk for Each Decade by Alternative



Indirect effects that may occur are described below. Timber harvest, which eliminates suitable spotted owl habitat, habitat could occur on over 700,000 acres on the Forest. Snags and down woody material serve as important habitat for woodpeckers, marten, and spotted owl and as stands with these characteristics are harvested and brought under intensive management, pileated woodpecker, pine marten, and spotted owl habitat diminish. Implementation of this alternative will have the greatest impacts of all the alternatives to wildlife populations dependant on mature and old forests.

Harvest of the old ponderosa pine will have substantial impacts on the pine/oak habitat critical to turkey and squirrel. As these stands are harvested and brought under intensive management ,Merriam's turkey and silver-gray squirrel habitat will diminish.

Illegal firewood cutting of snags and down trees for wildlife continues to occur and can have serious impact on cavity nesting species, especially in those timber harvest units where only the minimum amount of wildlife trees have been maintained. As access to more and more of the forest is facilitated by the building of new roads, this problem will continue. Snags are usually cut near roads and in clearcut units accessed by open roads.

Deer and elk would continue to supply significant recreation to the public. Currently, there are 136,000 WFUDs on the Forest. WFUDs would increase by 21,000 in the 1st decade, decrease by 32,000 in the 2nd and decrease by 22,000 in the 5th.

Cumulative Effects

Over the next 50 years, this alternative along with Alternatives A and C will probably provide the least amount of wildlife habitat of all the alternatives. Long term, the viability risk to spotted owls, pine marten, pileated woodpecker and the species guilds they represent are greatest in this alternative. Habitat protection for squirrel and turkey is comparable to Alternatives A and C. Like Alternatives A and C, this alternative provides little long term protection for bald eagles and peregrine falcons.

Managing on a 100 year rotation in lands managed for timber harvest would provide a continual rotating supply of early successional stages (forage and hiding cover). There would be a decline in optimal cover and by the 5th decade there would be significant lack of optimal cover. This decline would be critical to deer and elk populations due to their dependence on thermal cover in winter range. Deer and elk populations may decline in response to an overall decrease in habitat capability.

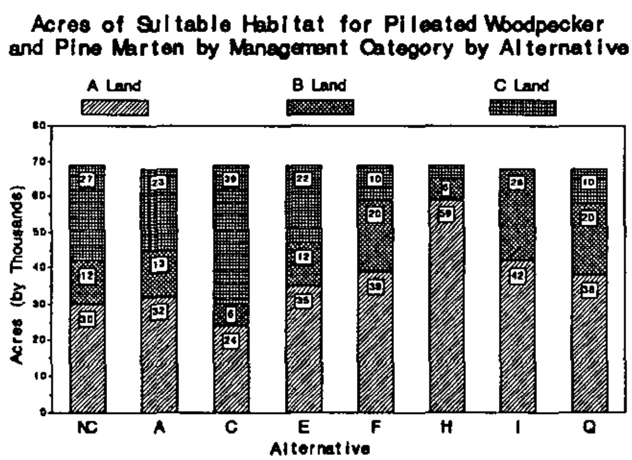
Alternative A

Direct and Indirect Effects

This alternative will meet the Regional Management Requirements (MR) for pileated woodpecker, pine marten, and spotted owl (Table IV-19). It is assumed that implementation of this alternative will ensure the existence of these species at a viable level. Management will consist of 96 MR areas for pileated woodpecker, 231 MR areas for pine marten, and 66 MR areas for spotted owl.

Each of the habitat areas or MR's for woodpecker and pine marten provides a 300 acre and 160 acre core of habitat for the pileated woodpecker and pine marten respectively. These numbers will remain constant for decades 1-5. Under this alternative 38 percent of the suitable pileated woodpecker/pine marten habitat is in commercial forest land. Alternatives NC, A and C provides for the least protection of suitable habitat for spotted owl, pileated woodpecker and pine marten. Pileated woodpecker habitat will decrease by 11 percent at Decade 2 and 24 percent by Decade 5 from current levels (Figure IV-32). Pine marten habitat will decrease by 9 percent and 22 percent by Decades 2 and 5 respectively. At least 40 percent of the maximum biological potential of cavity nesting species shall be maintained over time through Forest Wide Standards and Guidelines.

Figure IV-32 Acres of Suitable Habitat for Pileated Woodpecker

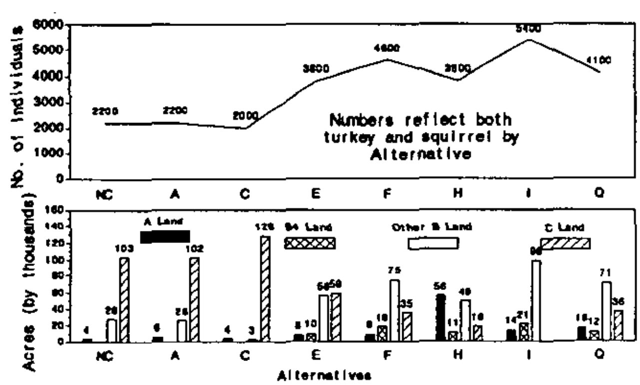


During the first decade suitable habitat exists for 680 habitat areas for pileated woodpecker and 996 for pine marten. By the beginning of the second decade these habitat areas will decrease to 647 and 952 for pileated woodpecker and pine marten, respectively. By the fifth decade the numbers will decrease to 547 and 819.

Sixty-six management areas will be maintained for spotted owls across the Forest. Each management area will consist of 1500 acres of suitable spotted owl habitat, comprised of at least a 300 acre core, with at least 40 acre parcels surrounding the core, all within a 1.5 mile radius. Approximately 38 percent of the suitable spotted owl habitat will be located on Commercial Forest Land and managed for timber production, with an additional 21% of the suitable habitat lying on lands managed for multiple resources and harvested at a reduced yield. Suitable spotted owl habitat will decrease from current totals by 11 percent by the end of the 2nd decade, and by 24 percent by the end of the fifth decade due to timber harvest. These percentages do not take into account maturation of younger stands. The habitat capability for spotted owls would decrease from 180 pairs to 137 pairs over the 50 year time frame. Additional protection of spotted owl habitat would be provided through the designation of Wilderness, and other "A" land allocations. Total amount of protected lands on the Forest would amount to approximately 400,000. Of that total, approximately 245,000 acres are considered suitable spotted owl habitat. This amount includes the Columbia Gorge National Scenic Area and the Bull Run Watershed Management Area, which account for about 83,000 acres of the suitable total.

No standards for the management of the pine/oak habitat exist under this alternative. Seventy-six percent of the turkey and squirrel habitat is managed for timber under this alternative (Table IV-20, Figure II-33). Of the remaining 24 percent, 4 percent will have no scheduled harvest, 20 percent reduced harvest. Turkey and squirrel populations for the first decade will be approximately 2200 individuals, each. For decades 2 and 5 turkey populations are estimated at 3300 and 3200, and squirrel at 3300 and 3200 respectively.

Figure IV-33 Population Estimates and Land Allocations for Merriam's Turkey and Silver-Gray Squirrel (Decade 1)



Approximately 174,000 acres of suitable habitat has been identified on the Forest for bald eagle and peregrine falcon. Under this alternative, approximately 89,000 acres would have no scheduled harvest, 40,000 reduced harvest and 44,000 would be on commercial forest land. Like Alternatives NC and C, Alternative A provides little protection for bald eagles and peregrine falcons. No management areas for bald eagles would be included in this alternative. This alternative provides the least habitat protection for T&E species through land allocations.

Alternative A continues managing under the Forest's existing plan, however it is adjusted to meet new laws and regulations. There would be no Forest-wide standards and guidelines for deer and elk. Timber harvest would continue without restriction in winter range and there would be low emphasis on habitat improvement projects. The amount of critical thermal cover in winter range would drop below minimum conditions necessary for deer and elk.

14 percent of the Forest (155,542 acres) would be managed for timber harvest by the 5th decade (approximately 2.8% of the Forest per decade), therefore a sustained supply of forage for deer and elk would be provided. Average opening size would substantially increase which equates to less quality forage available for deer and elk. Number of roads would decrease and amount of thermal cover would decrease. Habitat capability would remain constant and theoretically support 17,400 deer and 4,900 elk by the 5th decade.

Indirect effects that may occur include the following. Approximately 51,000 acres of spotted owl habitat would be protected on land otherwise managed for timber harvest. However, timber harvest activities that could eliminate spotted owl habitat may occur on over 650,000 acres on the Forest. Snags and down woody material serve as important substrates for woodpeckers, marten, and spotted owl and as stands with these characteristics are harvested and brought under intensive management, pileated woodpecker, pine marten, and spotted owl habitat diminish. The amount of habitat loss occurring on commercial forest land will have a deleterious effect on wildlife populations dependant on mature and old growth forest.

Habitat allocations for pileated woodpecker and pine marten will result in a reduced yield on lands managed for timber harvest; 143,600 ac fall into this category, although many sites contain overlapping land allocations installed to meet other resource objectives.

Illegal firewood cutting of snags and down trees for wildlife continues to occur and can have serious impact on cavity nesting species, especially in those timber harvest units where only the minimum amount of wildlife trees have been maintained. As access to more and more of the forest is facilitated by the building of new roads, this problem will continue. Snags are usually cut near roads and in clearcut units accessed by open roads.

Because this alternative provides for highest amount of timber possible in existing land allocation, suitable habitat for the turkey and squirrel will decline.

Deer and elk would continue to supply significant recreation to the public. Currently, there are 136,000 WFUDs on the Forest. WFUDs would increase by 33,000 in the 1st decade, 11,000 in the 2nd and 21,000 in the 5th.

Cumulative Effects

Over the next 50 years, this alternative along with Alternatives NC and C will probably provide the least amount of wildlife habitat of all the alternatives. Long term, the viability risk to spotted owls, pine martens, pileated woodpeckers and the species guilds they represent are greatest in this alternative. Habitat protection for squirrel and turkey is comparable to Alternatives NC and C. Like Alternatives NC and C, this alternative provides little long term protection for bald eagles and peregrine falcons.

Managing on a 100 year rotation in lands managed for timber harvest would provide a continual rotating supply of early successional stages (forage and hiding cover). There would be a gradual decline in optimal cover and by the 5th decade there would be significant lack of optimal cover. This decline would be critical to deer and elk populations due to their dependence on thermal cover in winter range. Deer and elk populations may remain constant or decline in response to constant low habitat capability.

Alternative C

Direct and Indirect Effects

This alternative will meet the Regional Management Requirements (MR) for pileated woodpecker, pine marten, and spotted owl (Table IV-32). Management will consist of 96 MR areas for pileated woodpecker, 231 MR areas for pine marten, and 66 MRs for spotted owl. These numbers will remain constant for decades 1-5. Under this alternative 50 percent of the suitable pileated woodpecker/pine marten habitat is in commercial forest land. Pileated woodpecker habitat will decrease by 12 percent at Decade 2 and 28 percent by Decade 5 from current levels (Figure IV-a). Pine marten habitat will decrease by 11 percent and 26 percent by Decades 2 and 5 respectively under this alternative. At least 40 percent of the maximum biological potential of cavity nesting species shall be maintained over time through Forest Wide Standards and Guidelines.

During the first decade suitable habitat exists for 671 habitat areas for pileated woodpecker and 984 for pine marten. By the beginning of the second decade these habitat areas will decrease to 631 and 931 for pileated woodpecker and pine marten, respectively. By the fifth decade the numbers will decrease to 515 and 776.

Sixty-six management areas will be maintained for spotted owls across the Forest. Approximately 50 percent of the suitable spotted owl habitat will be located on commercial forest land and managed for timber production, with an additional 9% of the suitable habitat lying on lands managed for multiple resources and harvested at a reduced yield. Suitable spotted owl habitat will decrease from current totals by 12 percent by the end of the 2nd decade, and by 28 percent by the end of the fifth decade due to timber harvest. The percentages do not take into account maturation of younger stands. The habitat capability for spotted owls would decrease from 180 pairs to 128 pairs over the 50 year time frame. Additional protection of some spotted owl habitat would be provided for through the designation of Wilderness, and other "A" land allocations. Total amount of protected lands on the Forest would amount to approximately 380,000. Of that total, approximately 235,000 acres are considered suitable spotted owl habitat. This amount includes the Columbia Gorge National Scenic Area, the Bull Run Watershed Management Area, which account for about 83,000 acres of the suitable total.

No standards for the management of the pine/oak habitat exist under this alternative. Ninety-five percent of the suitable turkey and squirrel habitat will be managed for timber under this alternative, the remaining 5 percent having no scheduled timber harvest (Table IV-20, Figure II-33). Turkey and squirrel populations for the first decade will be approximately 2000 individuals, each. For decades 2 and 5 turkey populations are estimated at 3000 and 2900, and squirrel at 2800 and 2700 respectively. This alternative provides the least amount of protection of suitable habitat for these two species.

Approximately 174,000 acres of suitable habitat has been identified on the Forest for bald eagle and peregrine falcon. Under this alternative, approximately 92,000 acres would have no scheduled harvest, 10,000 reduced harvest and 74,000 would be on commercial forest land. This alternative, like Alternatives A and NC, provides minimal protection for peregrine falcons and bald eagles. This alternative provides the very little habitat protection for these two species through land allocations.

Alternative C would provide maximum timber harvests for the next 30 years, while meeting management requirements. This alternative would harvest the most timber. There would be no Forest-wide standards and guidelines for deer and elk. Timber harvest would continue without restriction in winter range and there would be low emphasis on habitat improvement projects. The amount of critical thermal cover in winter range would drop below minimum conditions necessary for deer and elk.

17 percent of the Forest (184,516 acres) would be managed for timber harvest by the 5th decade (approximately 3.3% of the Forest per decade), therefore a sustained supply of forage for deer and elk would be provided. Average opening size would increase which equates to less quality forage available for deer and elk. Number of roads would decrease and amount of thermal cover would decrease. Habitat capability would remain constant and theoretically support 16,600 deer and 4,700 elk by the 5th decade.

Indirect effects may include the following. Approximately 51,000 acres of mature and old growth forest would be protected for spotted owls on land otherwise managed for timber harvest. Timber harvest activities could occur on 650,000 acres of the Forest. This could result in some loss of spotted owl habitat. Snags and down woody material serve as important substrates for woodpeckers, marten, and spotted owl and as stands with these characteristics are harvested and brought under intensive management, pileated woodpecker, pine marten, and spotted owl habitat diminish. The amount of habitat loss occurring on commercial forest land would have a deleterious effect on wildlife populations dependant on mature and old growth forest.

Fragmentation of spotted owl habitat, pileated woodpecker, and pine marten habitat is likely under this alternative. Fragmented habitats may be less favorable for such as spotted owl, pileated woodpecker and pine marten than more contiguous habitat. Land allocations for pileated woodpecker and pine marten will result in a reduced yield on lands managed for timber harvest; 143,653 acres fall into this category, although many sites contain overlapping land allocations installed to meet other resource objectives.

Illegal firewood cutting of snags and down trees for wildlife continues to occur and can have serious impact on cavity nesting species, especially in those timber harvest units where only the minimum amount of wildlife trees have been maintained. As access to more and more of the forest is facilitated by the building of new roads, this problem will continue. Snags are usually cut near roads and in clearcut units accessed by open roads.

Because this alternative provides for highest amount of timber possible in existing land allocation, suitable habitat for the turkey and squirrel will decline.

Deer and elk would continue to supply significant recreation to the public. Currently, there are 136,000 WFUDs on the Forest. WFUDs would increase by 21,000 in the 1st decade, decrease to current levels in the 2nd and increase by 11,000 in the 5th.

Cumulative Effects

Over the next 50 years, this alternative along with Alternatives NC and A will probably provide the least amount of wildlife habitat of all the alternatives. Long term, the viability risk to spotted owls, pine martens, pileated woodpeckers and the species guilds they represent are greatest in this alternative. Habitat protection for squirrel and turkey is comparable to Alternatives NC and A. Like Alternatives NC and A, this alternative provides little long term protection for bald eagles and peregrine falcons.

Managing on a 100 year rotation in lands managed for timber harvest would provide a continual rotating supply of early successional stages (forage and hiding cover). There would be a substantial decline in optimal cover and by the 5th decade, there would be significant lack of optimal cover. This decline would be critical to deer and elk populations due to their dependence on thermal cover in winter range. Deer and elk populations may remain constant or decline in response to constant low habitat capability.

Alternative E

Direct and Indirect Effect

This alternative will meet the Regional Management Requirements (MR) for pileated woodpecker, pine marten, and spotted owl. Management will consist of 96 MR areas for pileated woodpecker, 231 MR areas for pine marten, and 66 MR areas for spotted owl. These numbers will remain constant for decades 1-5. Under this alternative 32 percent of the suitable pileated woodpecker/pine marten habitat is in commercial forest land. Pileated woodpecker habitat will decrease by 13 percent at Decade 2 and 27 percent by Decade 5 from current levels (Figure IV-a). Pine marten habitat will decrease by 12 percent and 24 percent by Decades 2 and 5 respectively under this alternative. At least 40 percent of the maximum biological potential of cavity nesting species shall be maintained over time through Forest Wide Standards and Guidelines.

During the first decade suitable habitat exists for 667 habitat areas for pileated woodpecker and 977 for pine marten. By the beginning of the second decade these habitat areas will decrease to 625 and 922 for pileated woodpecker and pine marten, respectively. By the fifth decade the numbers will decrease to 528 and 794.

Sixty-six management areas will be maintained for spotted owls across the Forest. Approximately 33 percent of the suitable spotted owl habitat will be located on commercial forest land and managed for timber production, with an additional 24% of the suitable habitat lying on lands managed for multiple resources and harvested at a reduced yield. Suitable spotted owl habitat will decrease from current totals by 13 percent by the end of the 2nd decade, and by 27 percent by the end of the fifth decade due to timber harvest. The percentages do not take into account maturation of younger stands. The habitat capability for spotted owls would decrease from 180 pairs to 131 pairs over the 50 year time frame. Additional protection of some spotted owl habitat would be provided for through the designation of Wilderness, and other "A" land allocations. Total amount of protected lands on the Forest would amount to approximately 440,000 acres. Of that total, approximately 260,000 acres are considered suitable spotted owl habitat. This amount includes the Columbia Gorge National Scenic Area, the Bull Run Watershed Management Area, which account for about 83,000 acres of the suitable total.

Standards and Guidelines for turkey and squirrel will be incorporated under this alternative. Management emphasis and a specific land allocation (B4) would be provided on the east side of the forest for turkey and squirrel range. Approximately 18,800 acres (14 percent) of the turkey/squirrel habitat will be managed primarily for turkey and squirrel. Forty-four percent of the identified turkey and squirrel range will be managed for timber production. Turkey and squirrel populations for the first decade will be approximately 3,700 individuals, each. For decades 2 and 5 turkey populations are estimated at 4900 and 4850, and squirrel at 5320 and 5300 respectively. This alternative does not provide for as much suitable habitat as Alternatives Q, H and I, but does provide for more than Alternatives A and C.

Under this alternative, the addition of land allocation B4 would also contribute to protection of pine/oak habitat.

Approximately 174,000 acres of suitable habitat has been identified on the Forest for bald eagle and peregrine falcon. Under this alternative, approximately 100,000 acres would have no scheduled harvest, 47,000 reduced harvest and 27,000 would be on commercial forest land. This alternative, while placing a greater amount of habitat in no or reduced harvest areas than Alternatives NC, A and C, does not place as much habitat in these land allocations as Alternatives F,H,I and Q.

Alternative E reflects present land uses while meeting minimum management requirements. Forest-wide standards and guidelines for deer and elk would be incorporated. Timber harvest would be slightly restricted within winter range and there would be moderate emphasis on habitat improvement projects. The amount of critical thermal cover in winter range should remain at current conditions for deer and elk.

Fifteen percent of the Forest (169,166 acres) would be managed for timber harvest by the 5th decade (approximately 3.0% of the Forest per decade), therefore a sustained supply of forage for deer and elk would be provided. Average opening size would slightly increase, therefore forage quality and availability would remain constant for deer and elk. Number of roads would decrease and amount of thermal cover would decrease. Habitat capability would increase by 30% in the 1st decade and then remain constant. This would theoretically support 23,300 deer and 6,300 elk by the 5th decade.

The following paragraphs describe the indirect effects of Alternative E. Approximately 51,000 acres of suitable spotted owl habitat would be protected for on land otherwise managed for timber harvest. However, timber harvest activities that will eliminate spotted owl habitat may occur on over 600,000 acres on the Forest. Snags and down woody material serve as important substrates for woodpeckers, marten, and spotted owl and as stands with these characteristics are harvested and brought under intensive management, pileated woodpecker, pine marten, and spotted owl habitat diminish. The amount of habitat loss occurring on commercial forest land would have a deleterious effect on wildlife populations dependant on mature and old growth forest.

Fragmentation of spotted owl, pileated woodpecker and pine marten habitat is likely to occur under this alternative. Fragmented habitats may be less favorable for species such as spotted owl, pileated woodpecker and pine marten than more contiguous habitat. Habitat allocations for pileated woodpecker and pine marten will result in a reduced yield on lands managed for timber harvest; 143,653 acres fall into this category, although many sites contain overlapping land allocations installed to meet other resource objectives.

Illegal firewood cutting of snags and down trees for wildlife continues to occur and can have serious impact on cavity nesting species, especially in those timber harvest units where only the minimum amount of wildlife trees have been maintained. As access to more and more of the forest is facilitated by the building of new roads, this problem will continue. Snags are usually cut near roads and in clearcut units accessed by open roads.

Deer and elk would continue to supply significant recreation to the public. Currently, there are 136,000 WFUDs on the Forest. WFUDs would increase by 110,000 in the 1st decade, 99,000 in the 2nd and 99,000 in the 5th.

Cumulative Effects

Long term, Alternative E is midway between Alternatives H and I and Alternatives NC, A and C. It is comparable to Alternative Q in the amount of wildlife habitat that would be protected by allocation of land. Habitat capability for spotted owls is expected to decrease from 180 to 131 pairs over the next 50 years. Both pileated woodpecker and pine marten are expected to decrease over the next 50 years under this alternative.

Managing on a 100 year rotation in lands managed for timber harvest would provide a continual rotating supply of early successional stages (forage and hiding cover). There would be a gradual decline in optimal cover and by the 5th decade, there would be less optimal cover. This decline may affect deer and elk populations due to their dependence on thermal cover in winter range. However, deer and elk populations may increase in response to an overall increase in habitat capability.

Alternative F

Direct and Indirect Effects

This alternative meets the Regional Management Requirements (MR) for pileated woodpecker and pine marten. Management will consist of 96 MR areas for pileated woodpecker, 231 MR areas for pine marten, and 66 MR areas for spotted owl. These numbers will remain constant for decades 1-5. Under this alternative 15 percent of the suitable pileated woodpecker/pine marten habitat is in commercial forest land. Pileated woodpecker habitat will decrease by 7 percent at Decade 2 and 16 percent by Decade 5 from current levels (Figure IV-a). Pine marten habitat would decrease by 6 percent and 15 percent by Decades 2 and 5 respectively under this alternative. At least 40 percent of the maximum biological potential of cavity nesting species shall be maintained over time through forestwide standards and guidelines.

During the first decade suitable habitat exists for 694 habitat areas for pileated woodpecker and 1014 for pine marten. By the beginning of the second decade these habitat areas will decrease to 670 and 983 for pileated woodpecker and pine marten, respectively. By the fifth decade the numbers will decrease to 605 and 895.

Sixty-six management areas will be maintained for spotted owls across the Forest. Approximately 15 percent of the suitable spotted owl habitat will be located on commercial forest land and managed for timber production, with an additional 36% of the suitable habitat lying on lands managed for multiple resources and harvested at a reduced yield. Suitable spotted owl habitat will decrease from current totals by 7 percent by the end of the 2nd decade, and by 16 percent by the end of the fifth decade due to timber harvest. The percentages do not take into account recruitment of younger stands. The habitat capability for spotted owls would decrease from 180 pairs to 151 pairs over the 50 year time frame. Additional protection of some spotted owl habitat would be provided for through the designation of Wilderness, and other "A" land allocations. Total amount of protected lands on the Forest would amount to approximately 485,000 acres. Of that total, approximately 285,000 acres are considered suitable spotted owl habitat. This amount includes the Columbia Gorge National Scenic Area, the Bull Run Watershed Management Area, which account for about 83,000 acres of the suitable total.

Standards and guidelines for turkey and squirrel will be incorporated under this alternative. Management emphasis and a specific land allocation (B4) will be provided on the east side of the forest for approximately 21 percent of the turkey and squirrel range. Approximately 28700 acres will be managed primarily for turkey and squirrel. Alternative F provides the second highest amount of land in Allocations A and B, which will help to maintain suitable turkey/squirrel habitat. Turkey and squirrel populations for the first decade will be approximately 4600 individuals, each. For decades 2 and 5 turkey populations are estimated at 5800 and 5900, and squirrel at 7300 and 7500, respectively.

Because this alternative was developed as a particular response to the recreation public issue, additional land allocations under this alternative would also contribute to protection of old growth/mature and pine/oak habitat.

Approximately 174,000 acres of suitable habitat has been identified on the Forest for bald eagle and peregrine falcon. Under this alternative, approximately 110,000 acres would have no scheduled harvest, 54,000 reduced harvest and 12,000 would be on commercial forest land. In addition, a specific land allocation for bald eagles (A-13) would be included in this alternative. This alternative is mid range in the amount of habitat allocated to no or reduced harvest areas. Alternative F places slightly more eagle and peregrine habitat under no scheduled harvest land allocations than the preferred alternative. It does not place as much habitat in these land allocations as H and I.

Alternative F responds to the recreation public issue. Forest-wide standards and guidelines for deer and elk would be incorporated as well as B10 land allocation for winter range. Timber harvest would be most restricted within winter range and there would be moderate-high emphasis on habitat improvement projects. The amount of critical thermal cover in winter range should remain at optimal conditions for deer and elk.

Nine percent of the Forest (103,928 acres) would be managed for timber harvest by the 5th decade (approximately 1.9% of the Forest per decade), therefore a sustained supply of forage for deer and elk would be provided. Average opening size would slightly increase or remain the same, therefore forage availability would remain constant for deer and elk. Number of roads would substantially decrease and amount of thermal cover would decrease. Habitat capability would increase by 32% in the 1st decade and then slightly decline to theoretically support 24,100 deer and 6,500 elk by the 5th decade.

Indirect effects of Alternative F include the following. Timber harvest activities that will eliminate spotted owl habitat may occur on over 650,000 acres on the Forest. Snags and down woody material also serve as important substrates for woodpeckers, marten, and spotted owl and as stands with these characteristics are harvested and brought under intensive management, pileated woodpecker, pine marten, and spotted owl habitat diminish. The amount of habitat loss occurring on Forest land will not be as severe as Alternatives NC, A, C, E, and Q.

Illegal firewood cutting of snags and down trees for wildlife continues to occur and can have serious impact on cavity nesting species, especially in those timber harvest units where only the minimum amount of wildlife trees have been maintained. As access to more and more of the forest is facilitated by the building of new roads, this problem will continue. Snags are usually cut near roads and in clearcut units accessed by open roads.

In contrast to Alternative B, this alternative will indirectly benefit wildlife by retaining all existing Special Interest Areas and Research Natural Areas. Wildlife habitat will also be indirectly benefited by the classification of two rivers under the Wild and Scenic River system.

Deer and elk would continue to supply significant recreation to the public. Currently, there are 136,000 WFUDs on the Forest. WFUDs would increase by 121,000 in the 1st decade, 109,000 in the 2nd and 110,000 in the 5th.

Cumulative Effects

Overall, this alternative follows Alternative H and I in the amount of habitat managed for wildlife. After 50 years, spotted owl, woodpecker and marten habitat is comparable to Alternative I. Squirrel and turkey population numbers and available habitat is second only to Alternative I. Protected bald eagle and peregrine habitat follows Alternatives H and I.

Managing on a 100 year rotation in lands managed for timber harvest would provide a continual rotating supply of early successional stages (forage and hiding cover). There would be a gradual decline in optimal cover and by the 5th decade, there would be less optimal cover. This decline may affect deer and elk populations due to their dependence on thermal cover in winter range. However, deer and elk populations may increase in response to an overall increase in habitat capability.

Alternative H

Direct and Indirect Effects

Alternative H would preserve existing old growth timber stands as a diminishing resource, thus contributing to the protection of additional old growth/mature habitat throughout the Forest.

This alternative will meet the Regional Management Requirements (MR) for pileated woodpecker, pine marten, and spotted owl (Table IV-19). Management will consist of 96 MR areas for pileated woodpecker, 231 MR areas for pine marten, and 66 MR areas for spotted owl. These numbers will remain constant for decades 1-5. Under this alternative 10 percent of the suitable pileated woodpecker/pine marten habitat is in commercial forest land. Pileated woodpecker habitat will decrease by 5 percent at Decade 2 and 11 percent by Decade 5 from current levels (Figure IV-32). Pine marten habitat would decrease by 5 percent and 10 percent by Decades 2 and 5 respectively under this alternative. At least 40 percent of the maximum biological potential of cavity nesting species shall be maintained over time through Forest Wide Standards and Guidelines.

During the first decade suitable habitat exists for 701 habitat areas for pileated woodpecker and 1075 for pine marten. By the beginning of the second decade these habitat areas will decrease to 685 and 1001 for pileated woodpecker and pine marten, respectively. By the fifth decade the numbers will decrease to 639 and 941.

Sixty-six management areas will be maintained for spotted owls across the Forest. Approximately 10 percent of the suitable spotted owl habitat will be located on commercial forest land and managed for timber production, with an additional 16% of the suitable habitat lying on lands managed for multiple resources and harvested at a reduced yield. Suitable spotted owl habitat will decrease from current totals by 5 percent by the end of the 2nd decade, and by 11 percent by the end of the fifth decade due to timber harvest. The percentages do not take into account recruitment of younger stands. The habitat capability for spotted owls would decrease from 180 pairs to 160 pairs over the 50 year time frame. Additional protection of some spotted owl habitat would be provided for through the designation of Wilderness, and other "A" land allocations. Total amount of protected lands on the Forest would amount to approximately 730,000 acres. Of that total, approximately 440,000 acres are considered suitable spotted owl habitat. This amount includes the Columbia Gorge National Scenic Area, the Bull Run Watershed Management Area, which account for about 83,000 acres of the suitable total.

Standards and guidelines for turkey and squirrel are incorporated under this alternative. Management emphasis and a specific land allocation (B4) will be provided on the east side of the forest for 16 percent of the turkey and squirrel range (Table IV-20, Figure II-33). Approximately 20855 acres would be managed primarily for turkey and squirrel. Turkey and squirrel populations for the first decade will be approximately 3800 individuals, each. For decades 2 and 5 turkey populations are estimated at 5500 and 5400, and squirrel at 6100 and 6000 respectively.

Approximately 174,000 acres of suitable habitat has been identified on the Forest for bald eagle and peregrine falcon. Under this alternative, approximately 140,000 acres would have no scheduled harvest, 26,000 acres reduced harvest and 9,000 acres would be on commercial forest land. In addition, a specific land allocation for bald eagles (A-13) would be included in this alternative. Along with Alternative I, this alternative provides the greatest protection of all the alternatives for these two species.

Alternative H would preserve existing old-growth timber stands as diminishing biological and cultural resource. Forest-wide standards and guidelines for deer and elk would be incorporated as well as B10 land allocation for winter range and B11 land allocation for summer range emphasis areas. Timber harvest would be restricted within winter range and there would be moderate to high emphasis on habitat improvement projects. The amount of critical thermal cover in winter range should remain at optimal conditions for deer and elk.

Seven percent of the Forest (73,623 acres) would be managed for timber harvest by the 5th decade (approximately 1.3% of the Forest per decade), therefore a sustained supply of forage for deer and elk would be provided. Average opening size would decrease therefore forage quality and availability would increase for deer and elk. Number of roads would decrease and amount of thermal cover would increase. Habitat capability would increase by 36% in the 1st decade and then decline slightly. This would theoretically support 26,600 deer and 6,900 elk by the 5th decade.

Indirect effects of Alternative H are described below. Timber harvest activities that eliminate spotted owl habitat may occur on over 400,000 acres on the Forest. Snags and down woody material also serve as important substrates for woodpeckers, marten, and spotted owl and as stands with these characteristics are harvested and brought under intensive management, pileated woodpecker, pine marten, and spotted owl habitat diminish. This alternative would provide more spotted owl habitat protection than any other alternative.

Deer and elk would continue to supply significant recreation to the public. Currently, there are 136,000 WFUDs on the Forest. WFUDs would increase by 152,000 in the 1st decade, 99,000 in the 2nd and 141,000 in the 5th.

Cumulative Effects

Alternative H provides the greatest amount of wildlife habitat of all the alternatives. Alternative H provides for more long term protection of significant amounts of mature/old growth habitat than any other alternative presented. In comparison with all of the other alternatives, long term viability risk to spotted owls, pine martens and pileated woodpeckers is the lowest under this alternative. The amount of habitat available for turkey and squirrel is also significant, although not the highest of all the alternatives. For bald eagles and peregrines, this alternative protects by allocation of land, the greatest amount of habitat protection.

Managing some lands for timber harvest would provide a continual rotating supply of early successional stages (forage and hiding cover) in lands that have already been harvested. There would be an increase in thermal cover and by the 5th decade, there would be more thermal cover. This would result in greater habitat capability for deer and elk due to increased thermal cover, decreased road density and increased forage quality as a result of moderate emphasis on big game habitat improvement projects. Deer and elk populations may increase in response to an overall increase in habitat capability.

Alternative I

Direct and Indirect Effects

Alternative I meets the Regional Management Requirements (MR) for pileated woodpecker and pine marten (Table IV-19). Management will consist of 96 MR areas for pileated woodpecker, 231 MR areas for pine marten, and 66 MR areas for spotted owls. The number of areas will remain constant for decades 1-5. Under this alternative no suitable pileated woodpecker/pine marten habitat is in commercial forest land. Pileated woodpecker habitat will decrease by 7 percent at Decade 2 and 17 percent by Decade 5 from current levels (Figure IV-32). Pine marten habitat will decrease by 7 percent and 16 percent by Decades 2 and 5 respectively under this alternative. At least 40 percent of the maximum biological potential of cavity nesting species shall be maintained over time through Forest Wide Standards and Guidelines.

During the first decade suitable habitat exists for 692 habitat areas for pileated woodpecker and 1,011 for pine marten. By the beginning of the second decade these habitat areas will decrease to 667 and 979 for pileated woodpecker and pine marten, respectively. By the fifth decade the numbers will decrease to 595 and 882.

Sixty-six management areas will be maintained for spotted owls across the Forest. None of the suitable spotted owl habitat will be located on commercial forest land and managed for timber production. Forty-eight percent of the suitable habitat lying on lands managed for multiple resources and harvested at a reduced yield. Suitable spotted owl habitat will decrease from current totals by 7 percent by the end of the 2nd decade, and by 16 percent by the end of the fifth decade due to timber harvest. The percentages do not take into account maturation of younger stands. The habitat capability for spotted owls would decrease from 180 pairs to 149 pairs over the 50 year time frame. Additional protection of some spotted owl habitat would be provided for through the designation of Wilderness, and other "A" land allocations. Total amount of protected lands on the Forest would amount to approximately 530,000 acres. Of that total, approximately 310,000 acres are considered suitable spotted owl habitat. This amount includes the Columbia Gorge National Scenic Area, the Bull Run Watershed Management Area, which account for about 83,000 acres of the suitable total.

Retaining old growth will provide complementary benefits for both pileated woodpecker and pine marten. Approximately 55 percent of the suitable pileated woodpecker/pine marten habitat is allocated as A land, no scheduled timber harvest.

Standards and guidelines for turkey and squirrel will be incorporated under this alternative. Management emphasis and a specific land allocation (B4) on the east side of the forest incorporates 28 percent of the turkey and squirrel range (Table IV-20, Figure II-33). Approximately 37,800 acres would be managed primarily for turkey and squirrel. Under this alternative no lands within the 134,000 acres identified as turkey/squirrel habitat will be managed strictly for timber production. Turkey and squirrel populations for the first decade will be approximately 5,400 individuals, each. For decades 2 and 5 turkey populations are estimated at 6500 and 6,400, and squirrel at 7,000 and 6,900, respectively.

Approximately 174,000 acres of suitable habitat has been identified on the Forest for bald eagle and peregrine falcon. Under this alternative, approximately 115,000 acres would have no scheduled harvest and 59,000 acres would have reduced harvest. There is no commercial forest land under this alternative. In addition, a specific land allocation for bald eagles (A-13) would be included in this alternative. Along with Alternative H, this alternative provides the greatest protection of all the alternatives for these two species.

Alternative I was developed with emphasis on fish and wildlife management. Forestwide standards and guidelines for deer and elk would be incorporated as well as B10 land allocation for winter range and B11 land allocation for summer range emphasis areas. Timber harvest would be restricted within winter range and there would be high emphasis on habitat improvement projects. The amount of critical thermal cover in winter range would remain at optimal conditions for deer and elk.

Ten percent of the Forest (112,182 acres) would be managed for timber harvest by the 5th decade (approximately 2.0% of the Forest per decade), therefore a sustained supply of forage for deer and elk would be provided. Average opening size would decrease therefore forage quality and availability would increase for deer and elk. Number of roads would decrease and amount of thermal cover would increase to optimal conditions. Habitat capability would increase by 38% in the 1st decade and increase another 5% by the 5th decade. This would theoretically support 30,700 deer and 7,900 elk by the 5th decade.

Indirect effects for this alternative may include the following. This alternative will increase motorized,semi-primitive RVDs/year and nonmotorized, semi-primitive RVDs/year. Generally, this type of recreation use has less impact on wildlife than other more developed types of recreation.

Deer and elk would continue to supply significant recreation to the public. Currently, there are 136,000 WFUDs on the Forest. WFUDs would increase by 162,000 in the 1st decade, 141,000 in the 2nd and 195,000 in the 5th.

Cumulative Effects

Long term, the viability risks to spotted owls, pine martens and pileated woodpeckers and the species guilds they represent, are lower in this alternative than most others. This alternative is equal to Alternative F, in this regard, and second only to Alternative H. This alternative retains about three times as many unroaded areas in their current state after 50 years. Open roads reduce the habitat capability for many species of wildlife so long term impacts of this alternative are expected to be less. Habitat protection for turkey and squirrel is greatest under this alternative. This alternative provides protection by land allocation of significant portions of bald eagle and peregrine habitat.

Managing some lands for timber harvest would provide a continual rotating supply of early successional stages (forage and hiding cover). There would be an increase in thermal cover and by the 5th decade there would be more thermal cover. This would result in greater habitat capability for deer and elk due to increased thermal cover, decreased road density and increased forage quality as a result of high emphasis on big game habitat improvement projects. Deer and elk populations may increase in response to an overall increase in habitat capability.

Alternative Q

Direct and Indirect Effects

This alternative meets the Regional Management Requirements (MR) for pileated woodpecker and pine marten (Table IV-19). Management will consist of 96 MR areas for pileated woodpecker and 231 MR areas for pine marten. These numbers will remain constant for decades 1-5. Under this alternative 19 percent of the suitable pileated woodpecker/pine marten habitat is in commercial forest land. Pileated woodpecker habitat will decrease by 9 percent at Decade 2 and 20 percent by Decade 5 from current levels (Figure IV-32). Pine marten habitat will decrease by 8 percent and 19 percent by Decades 2 and 5 respectively under this alternative. Habitat capability for cavity nesters will be sustained at 60 percent in areas managed for timber.

Sixty-six management areas will be maintained for spotted owls across the Forest. Approximately 19% of the suitable spotted owl habitat will be located on commercial forest land and managed for timber production, with an additional 35% of the suitable habitat lying on lands managed for multiple resources and harvested at a reduced yield. Suitable spotted owl habitat will decrease from current totals by 9 percent by the end of the 2nd decade, and by 20 percent by the end of the fifth decade due to timber harvest. The percentages do not take into account maturation of younger stands. The habitat capability for spotted owls would decrease from 180 pairs to 144 pairs over the 50 year time frame. Additional protection of some spotted owl habitat would be provided for through the designation of Wilderness, and other "A" land allocations. Total amount of protected lands on the Forest would amount to approximately 460,000 acres. Of that total, approximately 272,000 acres are considered suitable spotted owl habitat. This amount includes the Columbia Gorge National Scenic Area, the Bull Run Watershed Management Area, which account for about 83,000 acres of the suitable total.

Retaining spotted owl habitat will provide complementary benefits for both pileated woodpecker and pine marten. Approximately 50 percent of the suitable pileated woodpecker/pine marten habitat is allocated as A land or no scheduled harvest areas.

During the first decade suitable habitat exists for 688 habitat areas for pileated woodpecker and 1007 for pine marten. By the beginning of the second decade these habitat areas will decrease to 657 and 965 for pileated woodpecker and pine marten, respectively. By the fifth decade the numbers will decrease to 577 and 854.

Standards and guidelines for turkey and squirrel will be incorporated under this alternative. Management emphasis and a specific land allocation (B4) will be provided on the east side of the forest for about 14 percent of the turkey and squirrel range (Table IV-20, Figure II-33). Approximately 22,600 acres would be managed primarily for turkey and squirrel. Turkey and squirrel populations for the first decade will be approximately 4100 individuals, each. For decades 2 and 5 turkey populations are estimated at 5600 and 5500, and squirrel at 6700 and 6500 respectively.

Approximately 174,000 acres of suitable habitat has been identified on the Forest for bald eagle and peregrine falcon. Under this alternative, approximately 110,000 acres would have no scheduled harvest, 47,000 reduced harvest and 18,000 would be on commercial forest land. In addition, a specific land allocation for bald eagles (A-13) would be included in this alternative. This alternative is mid range in the amount of habitat allocated to no or reduced harvest areas. Alternative F places slightly more eagle and peregrine habitat under no scheduled harvest land allocations than this alternative. It does not place as much habitat in these land allocations as H and I.

Alternative Q began with the draft EIS preferred alternative and incorporates reduced timber harvest in response to fisheries, wildlife and water quality issues. Forest-wide standards and guidelines for deer and elk would be incorporated as well as B10 land allocation for winter range and B11 land allocation for summer range emphasis areas. Timber harvest would be restricted within winter range and there would be moderate to high emphasis on habitat improvement projects. The amount of critical thermal cover in winter range should remain at optimal conditions for deer and elk.

Twelve percent of the Forest (135,022 acres) would be managed for timber harvest by the 5th decade (approximately 2.4% of the Forest per decade), therefore a sustained supply of forage for deer and elk would be provided. Average opening size would decrease, therefore forage quality and availability would increase for deer and elk. Number of roads would substantially decrease and amount of thermal cover would gradually decrease. Habitat capability would increase by 38% in the 1st decade and then remain constant. This would theoretically support 28,200 deer and 7,300 elk by the 5th decade.

Deer and elk would continue to supply significant recreation to the public. Currently, there are 136,000 WFUDs on the Forest. WFUDs would increase by 162,000 in the 1st decade, 141,000 in the 2nd and 162,000 in the 5th.

Cumulative Effects

Long term, Alternative Q is midway between Alternatives H and I and Alternatives NC, A and C in the amount of wildlife habitat protected by various land allocations. Habitat capability for spotted owls would decrease from 180 pairs to 144 pairs over 5 decades. Squirrel and turkey populations are expected to increase.

Managing on a 100 year rotation in lands managed for timber harvest would provide a continual rotating supply of early successional stages (forage and hiding cover). There would be a gradual decline in optimal cover and by the 5th decade, there would be less optimal cover. This decline may affect deer and elk populations due to their dependence on thermal cover in winter range. However, there would be an overall increase in habitat capability for deer and elk due to increased thermal cover, decreased road density and increased forage quality as a result of high emphasis on big game habitat improvement projects. Deer and elk populations may increase in response to this overall increase in habitat capability.

Bald Eagle Habitat

A variety of mitigation practices for the maintenance or enhancement of bald eagle habitat have been developed. Forest-wide Standards and Guidelines include adequate protection for each of the Recovery Areas identified in the Bald Eagle Recovery Plan. However, recent surveys indicate that eagles may be using other areas of the Forest not included in the Recovery Areas (C. Corkran, pers. commun., 1989, ODFW, 1989). Site-specific mitigation may be necessary if management or other human activities have the potential to disturb nesting or wintering eagles outside of recovery sites. Mitigation measures for these instances could include:

Enhancing spawning/rearing conditions for native populations of salmon, steelhead and trout, in order to enhance food supplies for eagles.

Topping, girdling, or partially limbing large dominant trees to create or maintain suitable perch, roost and perhaps nest habitat. This tactic has been used to increase hunting perch habitat along the Columbia River (Columbia Gorge RD, 1989).

Protection of newly discovered nest and roost sites by restricting recreational use, maintaining "no-cut" buffers around the site, imposing seasonal activity restrictions and signing of critical habitat.

Deer and Elk

Maintenance of an good cover/forage balances, protection of calving/fawning habitat, and the reduction of harassment on critical winter and summer ranges are the basis for deer and elk Standards and Guidelines. The standard for road density in winter range allocations (B10, B11) is 1.5 miles per square mile. At the end of the planning period, the standard for road densities on acres within inventoried winter range is 2.0 miles per square mile and 2.5 miles per square mile within inventoried summer range. However, that standard constitutes the least restrictive situation. The land manager retains the option to impose stricter standards if a conflicting situation arises that might jeopardize a viable local population. Planting of palatable browse species is a widely used measure for mitigating lost foraging opportunities for deer and elk. Silvicultural prescriptions that accelerate the development of optimal thermal cover should be investigated as a potential mitigative measure in winter range areas.

Management Indicator Species

In general, Forest-wide Standards and Guidelines and Management Prescriptions provide adequate protection for minimum viable populations of selected Forest Management Indicator Species, in each of the Action Alternatives. Species protection is to be achieved through protection of specific habitat types and/or structures, including snags, dead and down woody debris, deer and elk range, mature/old growth forests, pine/oak habitats, and threatened and endangered species habitats.

Management Requirements for maintaining viable populations establish the minimum levels of mature and old growth forest to be retained for these species. Old growth habitat lost to timber harvest (both within and outside the MR areas) cannot be mitigated. If new silvicultural methods are established to harvest timber while simultaneously providing for "old growth" structural characteristics at an early stand age, these methods may provide mitigation possibilities in the future.

Mitigation for loss of snag habitat involves the retention of current and future snags at various population levels between 60 and 90 percent of biological potential for primary cavity excavators on lands suitable for timber harvest. Retention of cavity nester habitat may be best achieved by retaining habitat "islands" as opposed to single trees. Islands retain some habitat integrity, while individual snags provide a single nest, foraging or perch site only. Nest boxes and the drilling of nest holes in trees are used to supplement habitat, but are generally viewed as a last resort, to be used only when natural habitat is unavailable. Dead and down woody material mitigation includes retention of slash piles and large woody debris on new harvest units. Mitigation for loss of dead and down habitat may also be feasible on existing harvest units: logs, root wads or other woody debris can often be placed back in older units, or adjacent uncut stands.

Pine/Oak Habitats

Pine/oak plant communities provide habitat on the east slope of the Cascades for several unique species. Specific mitigation strategies for this habitat type could include the following:

- Replanting of oak, restoration of oak and pine to areas that have been converted to other plant community types as a result of past management or other events.
- Seeding of palatable herbaceous and shrub species for deer and elk forage.
- Monitoring of pine/oak habitats should provide baseline data on the health of the introduced turkey population. Mitigation for any decline in turkey populations might include habitat restoration in the form of oak plantings, supplementing food supplies in years of poor mast production, or additional introductions to bolster population numbers and maintain genetic diversity.

Potential Conflicts with Plans and Policies of Other Jurisdictions

Please refer to the end of this chapter for a discussion of the possibility of conflicts between the alternatives and the plans and policies of other jurisdictions with responsibility or authority for this environmental component.

Diversity of Plant and Animal Communities

This section deals primarily with animal community diversity as it responds to changes in habitat and vegetation characteristics. Plant community diversity is discussed in Vegetation Component of this chapter. Other discussions of diversity occur in the Old Growth and Sensitive Plants sections of this chapter.

The National Forest Management Act (NFMA) requires forest diversity to be maintained or enhanced within a planning area. The Forest strategy is to deal with diversity by allocating some lands to management areas with no programmed harvest, by applying Standards and Guidelines to areas under active management, and by monitoring species and habitat throughout the Forest. The objective is to either assure maintenance of "natural" diversity, or indicate need for direction change.

A definition acceptable to a variety of value systems would help to simplify evaluation of the effects of management alternatives on diversity. The law requires that the "natural forest" be used as the basis for evaluating the maintenance of diversity. Yet existing conditions have been so thoroughly influenced by man that "natural" references are difficult to find and apply.

Significant Interactions

There are many agents of change which can affect ecosystem diversity. Fire, flood, and man all can have profound effects. Actively managed lands (Category C lands) are usually invaded by a rich mixture of early seral plant species, and frequented by animals that require open-structured habitat and shrub/forb dominated systems. Lands affected primarily by natural processes (Category A lands) can be species rich or poor depending on their successional history and age. It is generally agreed, however, that diversity is at risk when a high percentage of the land base is actively managed for consumptive purposes such as timber management. Indeed, many ownerships surrounding the Forest, are dominated by consumptive uses. As such, Forest lands allocated to non-consumptive uses act as refuges for those species that require later seral stages, such as spotted owl or western hemlock forest associations.

In most instances, lands allocated to non-consumptive uses are dominated by natural processes that shape forest composition and structure. In these areas compositional and structural diversity most closely approximate natural diversity. The risk to the maintenance of diversity is reduced in less consumptive alternatives. Conversely, there is a greater risk to the maintenance of diversity in the more consumptive alternatives. In actively managed areas, landscape fragmentation and ecosystem simplification are important concerns.

Direct and Indirect Effects

The effects of the alternatives on diversity vary over a wide range. Generally, as the amount of land managed for consumptive purposes increases, the risks to maintaining diversity also increases. The effects of roads and some recreation developments (such as overnight housing, ski areas, and buildings) are permanent. Alternatives with longer timber rotations increase the likelihood that some old growth attributes can be recovered in the very long run. Alternatives with longer rotations and reduced recreational development also generally have fewer long term impacts on wild life and threatened and endangered species.

In the long term, Alternatives A and C probably present the greatest risks to the long term maintenance of diversity while Alternative H and I are likely to present lower risks. Alternative is Q is midway between these two extremes.

Mitigation

Standards and Guidelines have been included in the Forest Plan to ameliorate and mitigate the impacts to diversity from land management activities. However, some Standards and Guidelines are as yet untried and thereby carry a degree of uncertainty as to their effectiveness. Consequently, there is a greater risk to the maintenance of diversity in the more consumptive alternatives.

Regardless of the allocation scheme, in every alternative all plant and animal species are managed at least to minimum viable levels, and management indicator species are monitored. The purpose of monitoring is to identify shortcomings in the Standards and Guidelines so that changes can be made. There is more to learn before we can conclusively and appropriately monitor and mange for diversity. Based on available information, we have set in motion our best effort.

Fire Management

Introduction

The number and size of fires depends primarily on the quantity of combustible vegetation available at the time of the fire. Amounts and types of management activities affect the number of fires that start and the level of fuel to keep them burning. Impacts of fire management under the various alternatives will be discussed in the sections that follow.

Related ICOs

- Develop programs using prescribed fire to maintain meadows.
- Use underburn opportunities to achieve long term fire management goals.

Significant Interactions

Fires not only cost large sums to control, they also can affect soil productivity, the quality and quantity of water, wildlife, fuels, and air quality. The degree of environmental impact depends on the size and intensity of a particular fire as well as how often fire occurs on any individual site. As would be expected, fires that start where fuel loadings are high and moisture low will burn with the greatest intensities and cause the greatest impacts. Wildfires frequently burn under such conditions, especially wildfires originating from industrial sources. On the other hand, fires burning where fuel moistures are high, such as prescribed fires, have low intensities, and environmental impacts are most often negligible.

Soil is indispensable resource of the forest ecosystem. The intensity of fire, and the resulting degree to which soils are exposed to heat, control the degree of changes in soil properties due to fire. Excessive heat affects land productivity and soil stability adversely. If, on the other hand, above ground fuels burn at such low intensity that soil temperature is not greatly increased, land productivity and soil stability may be unaffected or even enhanced. Fire of low intensity facilitates cycling of some soil nutrients. Immediately after a fire, soil pH, phosphorous, exchangeable potassium, calcium, and magnesium increase; but some nitrogen is lost due to volatilization. The loss of nitrogen is insignificant on low intensity fires, but nitrogen lost from the ecosystem due to high intensity fires burning when fuel moisture is low can be as high as 15 to 20 percent of the total nitrogen capital on the site. Fortunately, nitrogen fixation, both symbiotic and nonsymbiotic, often becomes more active following fire, and this restores essential nitrogen to the soil system. Nitrogen is required in virtually all plant growth in the forest ecosystem.

Low intensity fires may also help to control plant pathogens and as a rule do not increase soil erosion. Conversely, high intensity fires destroy organic matter and disrupt soil structure. This increases the threat of erosion and causes a loss in soil productivity potentials. Factors to be in evaluating the effects of fire on a specific site include (a) the frequency of burning, (b) the size and intensity of the fire, and (c) mitigating effects.

Soil characteristics are intimately connected with both the quantity and quality of water. The impact of water on soils involves such factors as rainfall interception rates, rainfall infiltration rates, the soil's ability to store moisture, snow accumulation and melt, and potentials for surface and mass erosion. The most powerful and important water quality responses associated with fire are sediment and turbidity. Fires that consume the majority of the duff layer and expose large areas of mineral soil close to streams have the greatest negative impacts. Prescribed fire conducted when the duff moisture content exceeds 75% will prevent such adverse effects.

Direct effects of fire on wildlife vary to extremes. Vertebrates rarely succumb to fire because they can flee from it. However, the immediate, post-fire environment presents surviving wildlife with a drastically changed habitat. Effects may be positive or negative depending on the species. For invertebrate animals, the main effects of fire are short term. Populations may drop because animals themselves or their eggs are killed. Their food supply and shelter may be destroyed or drastically reduced. On the other hand the indirect effects on populations of some species attracted through changes in vegetations that result in increased forage may increase after a fire.

Fire indirectly affects fish and other aquatic animals in proportion to the amount of streamside vegetation lost and sediment deposited into streams. Sedimentation can reduce the size of spawning gravels or deposit fine materials that smother eggs, prevent emergence of fry, increase losses to predators, and losses of aquatic foods. A common post-fire occurrence is increased nutrient loading of streams; however, concentrations seldom reach toxic levels, and the effects on productivity are usually beneficial.

The effects of fire on air quality are presented in the Air Quality component of this chapter. The relationship of concern being made here is that uncontrolled emissions of large volumes of smoke primarily affect visibility.

Table IV-21 Expected Number of Total Acres Burned by Wildfire

Acres Per Decade, Decades 1-5	Alternative							
	NC	A	C	E	F	H	I	Q (Preferred)
Decade 1	6,140	4,880	5,650	6,150	3,490	2,900	3,740	4,080
Decade 2	5,890	4,720	5,460	4,690	3,460	2,850	3,670	4,020
Decade 3	5,990	4,790	5,500	4,410	3,320	2,790	3,630	4,020
Decade 4	5,860	4,610	5,370	4,530	3,380	2,820	3,540	3,950
Decade 5	5,530	4,320	4,970	4,370	3,230	2,670	3,470	3,790

Direct and Indirect Effects

Wildfire Occurrence

Forest policy calls for the suppression of wildfires in a cost effective manner while also minimizing their effects on timber, plantations, water quality, and other resources. Based on historical fire occurence data and professional field experience, a wildfire is expected to occur for each 15,082 RVDs of recreation and general forest visitor use, for each 4,580 acres of timber harvest, and for each 3,590 acres of prescribed burning.

Table IV-21 displays the expected number of acres burned areas per decade for each alternative.

Wildfire incidence will be higher in alternatives which call for increased industrial operations and road access for recreation. In general, this is true for alternatives NC, A, C, and E.

Industrial operations connected with timber harvest cause the most damaging wildfires and account for most of the money spent on fire suppression. The percent of acres burned from industrial fires varies by alternative and decade but ranges between 70 to 80% of the total acres burned per decade. Many industrial fires start in timber stands of high value, and expensive equipment is often in the fire area.

Cut timber and logging slash are highly resistant to firefighting efforts so that extinguishing this class of fire is very expensive. Table IV-22 shows how industrial-caused fires would vary by alternative.

Fires caused by recreationist are higher in number than any other cause but the number of acres burned is much smaller than industrial fires. Due to a change in the mix of recreational opportunities on the Forest, the number of fires caused by recreationists is expected to decline in alternatives from the current (Alternative NC).

Wilderness Fire Management

The effects of fire in managed forests are usually negative, but some positive effects can also materialize, depending on the situation. Fires can have beneficial effects in Wilderness under carefully prescribed conditions. In all alternatives, fires will be allowed to play a more natural role in Wilderness. An analysis of ecosystem changes in Wilderness has shown little effect caused by the Forest's past policies of total fire suppression, an exception to this being the Badger/Jordan Wilderness. In all Wilderness, natural ignitions from lightning will be declared prescribed fires as long as they burn within approved prescription limits. In short, this policy will allow fire to resume its natural role in Wilderness ecosystems but within safe limits. If a Wilderness prescribed

Table IV-22 Expected Number of Industrial-Caused Fires Greater Than One Acre

Number Per Decade, Decades 1-5	Alternative							
	NC	A	C	E	F	H	I	Q (Preferred)
Decade 1	154.4	11.6	13.9	15.6	7.6	5.3	8.1	9.3
Decade 2	14.6	11.1	13.3	11.1	7.5	5.1	7.9	9.1
Decade 3	14.9	11.3	13.4	10.2	7.1	5.0	7.8	9.1
Decade 4	14.5	10.7	13.0	10.5	7.2	5.0	7.5	8.9
Decade 5	13.5	9.8	11.7	10.1	6.8	4.6	7.3	8.4

Table IV-23 Expected Number of Fires and Acres Burned from Fires Caused by Recreationists

Number Per Decade, Decades 1-5	Alternative							
	NC	A	C	E	F	H	I	Q (Preferred)
Number of Fires	619	597	619	585	535	612	575	559
Number of Acres Burned	1,150	1,110	1,150	1,080	990	1,140	1,070	1,040

fire exceeds its prescription limits, it will be declared a wildfire and put out. Suppression of Wilderness fires will be managed with minimum environmental impact and at minimum cost consistent with Wilderness management direction.

The eastern part of Badger/Jordan Wilderness contains extensive stands of mature ponderosa pine with dense understories of shade-tolerant conifers. This environment is contrary to natural conditions that would normally not have existed had fire been allowed to play its natural role in these stands. If future site-specific analysis indicates that these stands have been significantly altered from natural successional processes, and if natural fire cannot be allowed its natural role, the use of planned, prescribed ignitions will be considered.

Prescribed Fire Use

Residues from timber harvest may need to be treated to reduce fire hazards and to prepare the land for planting. These requirements affect the Forest's fire environment. On-site treatment quite may mean piling slash with tractors and burning it, or broadcast burning. Piling debris with tractors greatly reduces the risk of fire, and burning of piled debris is relatively safe from the risk of fire escape. However, piling slash with tractors compacts the soil, as discussed in the section Soil Resources of this chapter, and exposes the soil to erosion.

Tables IV-24 and IV-25 show the number of acres that will require fuel treatment and acres treated by prescribed fire. Acres not treated by prescribed fire are treated using such methods as yarding unutilized materials (YUM).

In Alternatives NC, A, C, and E, approximately 38% of the created residues will not be in quantity requiring treatment. Of the remaining 62% where treatment is necessary, 16% will be accomplished by treatments not requiring prescribed fire such as yarding of cull material. Hence 46% of the acres will receive treatment using prescribed fire.

In Alternatives F, H, I and Q, approximately 47% of the created residues will not be in quantity requiring treatment. Of the remaining 53% where treatment is necessary, 13% will be accomplished by treatments not requiring prescribed fire such as yarding of cull material. Hence 40% of acres will receive treatment using prescribed fire.

The effect of using prescribed fire on the air resource is discussed in Air Quality Component of this chapter.

Past experience shows that a small percentage of the acreage treated by prescribed fire will escape control and become a wildfire. The expected number of prescribed fire-caused wildfires appears in Table IV-26.

Table IV-24 Fuel Treatments Per Decade by Alternative
(Thousands of Acres)

Number Per Decade, Decades 1-5	Alternative							
	NC	A	C	E	F	H	I	Q (Preferred)
Decade 1	44.7	34.1	41.2	45.7	23.4	18.2	26.4	30.6
Decade 2	43.0	32.9	39.0	39.4	23.5	17.6	26.4	30.0
Decade 3	41.2	31.3	37.9	39.4	25.0	15.8	21.8	31.8
Decade 4	42.6	35.7	39.9	29.8	20.6	13.9	28.0	29.3
Decade 5	47.9	36.4	44.3	32.3	23.8	18.1	21.9	30.0

Table IV-25 Vegetative Treatment by Prescribed Burning Per Decade
(Thousands of Acres)

Number Per Decade, Decades 1-5	Alternative							
	NC	A	C	E	F	H	I	Q (Preferred)
Decade 1	33.4	25.7	31.4	36.0	17.2	13.3	20.2	24.1
Decade 2	32.4	24.9	29.9	30.2	17.5	12.9	19.9	23.0
Decade 3	30.8	23.2	27.9	28.7	18.8	12.1	16.0	24.0
Decade 4	31.7	25.9	29.1	21.0	14.9	10.1	22.7	22.9
Decade 5	35.7	27.9	33.1	24.8	18.2	14.0	16.2	23.8

Cumulative Effects of the Alternatives

The discussion of the Direct and Indirect Effects of each alternative on fire describes the minimal impact expected to occur as a result of related fire protection programs. The only effect that is expected to be cumulative in any form is the increase in acreage where harvest and silvicultural activities have created modified fuel bed conditions in terms of fuel loading and dryness. Since the acreages involved are significantly lower than historic levels, except for Alternatives NC, E, and C, the cumulative effects of the alternatives will be an improvement over what has historically occurred. In this respect some aspects of fire protection needs in future decades will be lower than in past decades.

Mitigation

Prescribed Fire Use

Improved utilization of wood residues and yarding unutilized material (YUM) would reduce the need to use prescribed fires. The chance of prescribed fires escaping into wildfires would be correspondingly reduced.

Restricting burns to times when soil and duff moisture is high would reduce impacts on the soil. Rapid mop-up of prescribed burns would reduce air quality impacts and chances of escape.

Industrial-caused Wildfires

The impacts of these fires would be mitigated through a high level of industrial fire prevention activity.

Wildfire Suppression

The effects of wildfire would be mitigated through fuel treatment, fire prevention programs, and cost effective fire suppression. Fuel treatment would decrease the fuel available for wildfires, their intensity, and the difficulty of controlling such fires. Prevention programs which concentrate on preventing expensive industrial fires would decrease fires started by human activities. Fire suppression would mitigate adverse impacts by keeping the size of the fire to a minimum while maximizing cost efficiency.

Table IV-26 Expected Number of Wildfires Greater Than One Acre Caused by Prescribed Burning (Forest Service)

Number Per Decade, Decades 1-5	Alternative							
	NC	A	C	E	F	H	I	Q (Preferred)
Decade 1	9.3	7.0	8.3	9.4	4.6	3.2	4.9	5.6
Decade 2	8.8	6.7	8.0	6.6	4.5	3.1	4.8	5.5
Decade 3	9.0	6.8	8.0	6.1	4.2	3.0	4.7	5.5
Decade 4	8.7	6.5	7.8	6.3	4.3	3.0	4.5	5.3
Decade 5	8.1	5.9	7.0	6.0	4.1	2.7	4.4	5.0

The effectiveness of measures used to mitigate wildfire impacts is increasing on the Mt. Hood National Forest. Prescribed fire escapes have been reduced in the past ten years and increasing sophistication in the use of prescribed fires has reduced soil impacts. These measures will be monitored using inventory of acres burned and review of specific projects for compliance with guidelines on acceptable levels of fuels.

Potential Conflicts with Plans and Policies of Other Jurisdictions

Please refer to the end of this chapter for a discussion of the possibility of conflicts between the alternatives and the plans and policies of other jurisdictions with responsibility or authority for this environmental component.

Socioeconomic Environment

Introduction

The major effects of the alternatives on the human environment would be changes in economic opportunities associated with Forest resources and changes in the quality of resources such as scenery, wildlife, and recreation use. Economic opportunities are examined by considering the amount of money which would be paid from Forest receipts to counties and changes in employment and income levels resulting from changes in Forest outputs, receipts, and expenditures. These factors, along with less quantifiable measures of changes in amenity values are considered in examining the effect of the alternatives on lifestyles and community structure.

Changes in management on the Mt. Hood National Forest could have profound effects on the people who live, work, and recreate on or near the Forest. However, these social and economic impacts are often the most difficult impacts to predict with certainty because of the many other variables which must be considered. These variables include economic indicators such as growth or slowdown both in the regional and national economies, and factors related to personal preferences for types of recreation activities.

In general, the effects of the alternatives are determined by comparing projected conditions in the next decade to average conditions from the past 10 years. The baseline from which social and economic changes are measured is an estimate of the present contribution of Forest activities and outputs to local communities. This baseline is intended to represent the average level of activities and outputs from the Forest.

The social analysis focuses on economic changes during the first decade within communities in the counties surrounding the Forest. These changes will result mostly from decreases in the amount of timber harvested, and increases in the recreation use of the Forest.

Chapter 3, "Social and Economic Setting," discusses the existing conditions on and around the Forest. For a more detailed discussion of assumptions and analysis procedures, refer to Appendix B, FEIS, "Social and Economic Impact Analysis."

Effects

The consequences of each alternative are characterized as direct, indirect, and cumulative. Direct effects are the estimated government expenditures for each alternative. As a result of these expenditures, the public consumes forest products (both goods and services). This in turn produces indirect effects including benefits, revenue, jobs, and incomes. Cumulative effects on the social and economic environment reflect the net effect of Forest Service programs on the entire array of Forest users. Examples of these effects include the economic viability of Forest programs, the total predicted changes in jobs and income, opportunity costs, and resulting impacts on lifestyles, attitudes, and community cohesion.

Direct Effects

Total Costs

Total program costs vary considerably by alternative, as shown in Table IV-30 Costs are tied to the units of outputs produced under the various alternatives; an alternative with a high level of timber harvest has higher total sale preparation and administration costs, for example. Costs by program area give an indication of how well-funded that program would be and what level of service would be provided. Costs are based on projections of proposed budgets and may not reflect funding that would be received in future years.

Capital Investments

Capital investments are expenditures for capital projects on the Forest (i.e.. trails, campgrounds, other facilities). These vary by alternative, as shown in Table IV-30 . Varying levels reflect an emphasis on short-term expenditures versus long-term investments, and also reflect the degree to which an alternative would emphasize mitigation projects. For example, alternatives with higher levels of timber harvest would require higher capital investments in water and wildlife mitigation projects.

Indirect Effects

Payments to Counties

Twenty-five percent of the gross receipts collected on the Forest are distributed to counties for school and road programs. These payments are projected for each alternative based on the receipts from future timber sales and fees from mineral leases, livestock grazing permits, campground users and special use permits. Most of the effects of changes in payments would be in Clackamas, Hood River, and Wasco Counties. The remaining effects would be in Multnomah, Jefferson, and Marion Counties. Changes in the amount of money paid to counties would change the amount of money available for road and school programs and could affect the taxes paid by local residents. The differences in payments to counties among alternatives would be due mostly to differences in the amount of timber harvested.

The annual payments to counties in the first decade are shown in Table IV-27. They are projected to range from $ 3.75 million (adjusted for inflation to 1982 dollars) in Alternative H to $ 11.4 million for Alternative NC. Under the preferred alternative, payments would be $ 6.35 million. These figures are the Forest-wide totals; this table also shows the amounts projected for individual counties. Payments can vary considerably from year to year (see Table III-24 FEIS). These values are based on the assumption that stumpage prices will be at the levels shown in FEIS Appendix B, Table B-5.

Table IV-27 First Decade Average Annual Payments to Counties (Millions $/Year)

Alternative	Millions $/Year
NC	12.0
A	8.9
C	11.0
E	11.8
F	5.8
H	4.0
I	6.1
Q	6.8

Employment and Income

Changes in Forest outputs which support local industries, payments to counties, and costs to operate the Forest (expenditures for salaries, services, and supplies) would result in changes in employment and income in local communities; this is shown in Table IV-28. These changes are projected for the first decade for the six counties surrounding the Forest, and are based on the expected level of timber harvest, recreational use, wildlife and fish habitat, payments to counties, and Forest Service expenditures. The projections include both the direct effects that changes in Forest outputs would have on jobs and income in the lumber and wood products, tourist, and fishing industries, and the indirect effects in all sectors of the local economy. The projections are based on the Mt. Hood National Forest IMPLAN model. The estimates have not been adjusted to account for recent advances in sawmill technology. Details of the IMPLAN model are provided in Appendix B, "Economic Impact Model."

The differences in jobs and wages among alternatives are primarily due to differences in the amount of timber available for harvest. More than half of the economic activity dependent on the Forest is associated, either directly or indirectly, with recreation related expenditures. A substantial amount of economic activity is associated with timber sales to local lumber and wood products industries, payments to counties from timber receipts, and Forest Service expenditures for timber and road management activities. In recent years the economic importance of recreation-related user expenditures has been increasing; this trend is expected to continue. Timber related effects tend to be concentrated in rural resource dependent communities so these effects are often felt more intensely than recreation effects.

CCC Crew constructing picnic tables, Circa 1930's.

All alternatives show a gain in jobs over the first decade is because of a strong projected growth in demand for recreation on the Forest. The job effects shown in Table IV-28 would be felt somewhat unevenly. Timber-related jobs will tend to be lost first. These job projections are based on changes in the allowable sale quantity, which would change in the first year of Plan implementation. Most of the job gains however, are related to growth in recreation, which as projected here would occur over a period of ten years.

Under all alternatives except F, H, and I, the magnitude of community change resulting from Forest activities is expected to be within the range of changes experienced by local communities during the last ten years. However, national and regional economic trends may modify the effects of the alternatives on local communities. For example, if timber is not harvested because of weak markets for wood products, fewer job opportunities would be provided than projected. Likewise, the past decade has seen a decline in labor intensity of wood products manufacturing. In 1979, sawmills in Oregon employed an average of 4.5 workers per MMBF of lumber produced; by 1986 there were only 2.8 workers employed per MMBF. If this trend continues in the future, there could be fewer jobs associated with timber manufacturing.

Table IV-28 First Decade Changes in Total Employment

Alternative	Changes in Jobs (No.)	Changes in Income (Millions$)
NC	2,906	62.4
A	1,452	25.7
C	1,977	40.3
E	2,561	55.3
F	461	-1.3
H	106	-12.2
I	-211	-14.8
Q	964	12.0

Benefits

Benefits include revenues received by the Forest for timber, AUMs, camping fees, and other special use fees. Benefits also include the value of recreation and other amenities on the Forest. Table IV-31 shows benefits by alternative. Alternatives with higher allowable sale quantities would produce larger levels of cash benefits; alternatives with lower harvest levels would produce more non-cash benefits.

Cumulative Effects

Cumulative social and economic effects related to Forest Service management are difficult to predict and define. There are many variables which shape the social and economic environment; most of these are beyond the control of the Mt. Hood National Forest. Preferred recreation activities and places often depend on trends and age of the population. High population densities can result in overcrowding at certain recreation areas.

The timber management policies of other national forests, other government land management agencies, and private landowners can combine to have dramatic effects on regional timber supplies. The preferred alternatives of other forest adjacent to the Mt. Hood call for decreases in the amount of timber harvested; over the next ten years less timber would be available from national forest land. Also, in 1991 a portion of the timber on the Warm Springs Reservation will no longer have to be available to the public and will probably all go to tribal mills. This will further exacerbate the timber supply situation on the east side of the Forest.

Lifestyles

Lifestyles are the characteristic ways different groups of people live, including both work and leisure time. Some people have lifestyles that are financially dependent on a particular Forest resource, such as people working in tourism, or the lumber and wood products industries. Others are less financially dependent on a particular Forest resource.

As was discussed in Chapter 3 of the Final EIS, people in communities around the Forest, or those who may be further away but still consider the Mt. Hood National Forest to be important to them, tend to fall into four groups. The lifestyles these people currently have may be very affected, or not at all affected, by changes in management on the Forest.

Communities

In Chapter 3 of the final EIS, we identified several communities or groups of communities that are affected by management on the Mt. Hood National Forest. Although people in these communities tend to fall into the four groups identified under "Lifestyles," the communities are sufficiently heterogeneous to be analyzed separately.

Table IV-29 Impacts by Alternatives

User Group	Nature of Impact	Impacts by Alternatives
Loggers and Wood Workers	Job Loss or Gain	Alternatives NC, E could increase employment opportunities; Alt. C could have a job decrease; Alts. A, F, H, I, Q could cause large job losses.
Recreationists	Quality and Quantitiy of Recreation	Quantity of most experiences about the same in all alternatives. Quality of experiences would tend to be better in Alt. E, F, H, I, Q. Perception of quality depends on type of experience sought.
Native Americans	Varied	The availability of traditional resources would decline under Alts. NC, A, C, and H; somewhat more resources would be available under Alts. E, F, and Q.
Long Distance Users	Varied Scenery	Water quality better under amenity alternatives. Those who depend on the Forest as a reliable source of commodities would be better off under NC.

The activities, resource outputs, and environmental conditions that would differ among the alternatives have the potential to affect the cohesion and the infrastructure of local communities. Cohesion refers to the degree of cooperation and lack of conflict in communities; their infrastructures are public and commercial facilities and services.

The effect of alternatives on local communities would differ by the amount of conflict that may be introduced in communities, and more importantly, by the need for public and commercial facilities. As discussed previously, the impact of the alternatives tend to be generated by changes in the county revenues which are tied to the timber program. As is the case of the effects of the alternatives on lifestyles, small rural communities have the potential to be affected more than larger communities.

Most communities are not static, but are constantly experiencing change. As noted in the discussion of the effects on lifestyles, communities are subject to many influences other than the Forest, as is the area as a whole. Because only about seven percent of the total employment in the counties surrounding the Forest is attributable to Forest outputs and activities, the changes proposed by the alternatives are mostly within the magnitude of change communities have experienced in the last ten years.

Portland Metropolitan Area

- amenity users benefit the most through increased quality of life
- enhanced recreation opportunities
- enhanced employment through recreation-related job gains and also as area's reputation of high quality of life increases
- slight decrease in timber-related employment but little difficulty finding other jobs
- no change in community cohesion
- Clark County, Washington County, Yamhill County
- amenity users benefit the most through increased quality of life
- enhanced recreation opportunities
- enhanced employment through recreation-related job gains and also as area's reputation of high quality of life increases
- no change in community cohesion
- Clackamas County
- in northwestern, urbanized and suburbanized portions of county, same effects as other suburban counties
- several small, timber-dependent communities may experience negative effects, such as Estacada and Molalla, where there could be mill closures and job losses among loggers. There could be gains because of exurban commuters, possibilities for new recreation-related and other industries, but sense of self has traditionally revolved around being a timber town.
- small timber towns will experience greatest change; if communities can successfully pull together to cope with change there will be an increase in community cohesion. Some communities will experience a lot of out-migration and a decrease in cohesion.

Mt. Hood Corridor

- a small number of wood products jobs, mostly loggers, would remain
- recreation-related businesses would grow substantially
- community cohesion would probably remain the same or increase somewhat; if a large portion of local businesses are bought by people out of the area cohesion could decrease

The Columbia Gorge

- a small number of wood products jobs, mostly loggers, would remain
- recreation-related businesses would grow substantially
- community cohesion would probably remain the same or increase somewhat; if a large portion of local businesses are bought by people out of the area cohesion could decrease

Hood River County

- Hood River area would continue to enjoy recreation-related growth
- wood products employment would decrease substantially in mill towns
- Hood River will probably see other industrial growth
- community cohesion would decrease as people move away from communities in search of jobs

Wasco County

- some growth of light industry in The Dalles; may change depending on price of electricity
- some growth in tourism/recreation industries; mostly in The Dalles
- wood products employment would decrease substantially in mill towns
- community cohesion would decrease as people move away from communities in search of jobs

Warm Springs Indian Reservation

- tourism related businesses would probably grow with general increase in recreation
- most alternatives do not provide good availability for a full range of traditional resources; this would negatively affect lifestyles and in some cases job possibilities

Effects by Alternative

The social and economic consequences associated with alternatives are presented in this section.

Alternative NC

Direct Effects

The direct effects of alternative NC would be $140.8 million total government expenditures for the 150-year planning period, discounted at four percent. Table IV-30 shows these expenditures broken out by resource area.

Indirect Effects

These effects would include an average annual timber sale volume of 313 MMBF in the first decade. By the end of the first decade, the Forest would be providing 12.7 million RVDs for recreation and 446 million WFUDs for fish and wildlife. Total benefits (discounted at four percent for a 150-year period) would equal $1429.8 million. Payments to counties would increase slightly from the current level of $9.7 million to a total of $11.4 million.

Cumulative Effects

The cumulative impacts on economic and social aspects of the environment are a present net value of $1,227.6 million. An additional 4100 jobs and $87.5 million in income would be generated by this alternative when compared to averages from the past ten years.

This alternative would provide local wood products industries with outputs similar to those that have been available in recent years. While this would not guarantee employment, it would provide a level of stability for these industries. However, because this alternative would cause conflict with urban dwellers who want to see harvest levels reduced, it would probably result in litigation over timber harvest similar to that seen in recent years.

Alternative A

Direct Effects

The direct effects of alternative A would be $117.5 million total government expenditures for the 150-year planning period, discounted at four percent. Table IV-30 shows these expenditures broken out by resource area.

Indirect Effects

These effects would include an average annual timber sale volume of 235 MMBF in the first decade. By the end of the first decade, the Forest would be providing 12.4 million RVDs for recreation and 458 million

WFUDs for fish and wildlife. Total benefits (discounted at four percent for a 150-year period) would equal $1,116.1 million. Payments to counties would decrease from the current level of $9.7 million to a total of $8.4 million.

Cumulative Effects

The cumulative impacts on economic and social aspects of the environment are a present net value of $910.6 million. An additional 3100 jobs and $60.8 million in income would be generated by this alternative when compared to averages from the past ten years.

This alternative could result in changes in communities with substantial wood products employment because of the loss of timber jobs it would produce.

Alternative C

Direct Effects

The direct effects of alternative C would be $134.0 million total government expenditures for the 150-year planning period, discounted at four percent. Table IV-30 shows these expenditures broken out by resource area.

Indirect Effects

These effects would include an average annual timber sale volume of 282 MMBF in the first decade. By the end of the first decade, the Forest would be providing 12.7 million RVDs for recreation and 446 million WFUDs for fish and wildlife. Total benefits (discounted at four percent for a 150-year period) would equal $1,299.1 million. Payments to counties would increase slightly from the current level of $9.7 million to a total of $10.4 million.

Cumulative Effects

The cumulative impacts on economic and social aspects of the environment are a present net value of $1,106.8 million. An additional 3700 jobs and $76.9 million in income would be generated by this alternative when compared to averages from the past ten years.

This alternative is the only one calling for increased harvest in the Bull Run watershed. Since this watershed is the source of controversy under current management direction, the alternative would aggravate existing controversy. There would be no other significant effects.

Alternative E

Direct Effects

The direct effects of alternative E would be $119.6 million total government expenditures for the 150-year planning period, discounted at four percent. Table IV-30 shows these expenditures broken out by resource area.

Indirect Effects

These effects would include an average annual timber sale volume of 317 MMBF in the first decade. By the end of the first decade, the Forest would be providing million RVDs for recreation and 535 million WFUDs for fish and wildlife. Total benefits (discounted at four percent for a 150-year period) would equal $1,095.6 million. Payments to counties would increase slightly from the current level of $9.7 million to a total of $10.8 million.

Cumulative Effects

The cumulative impacts on economic and social aspects of the environment are a present net value of $971.0 million. An additional 4100 jobs and $88.9 million in income would be generated by this alternative when compared to averages from the past ten years.

In the long-term, this alternative may destabilize communities because timber sale levels in the first decade would be substantially greater than long-term sustained yield. Communities with substantial employment in the wood products industry may benefit from the short-term increase in jobs and income. Conflicts with urban areas would accelerate.

Alternative F

Direct Effects

The direct effects of alternative F would be $100.1 million total government expenditures for the 150-year planning period, discounted at four percent. Table IV-30 shows these expenditures broken out by resource area.

Indirect Effects

These effects would include an average annual timber sale volume of 154 MMBF in the first decade. By the end of the first decade, the Forest would be providing 11.4 million RVDs for recreation and 546 million WFUDs for fish and wildlife. Total benefits (discounted at four percent for a 150-year period) would equal $ million. Payments to counties would decrease from the current level of $9.7 million to a total of $5.4 million.

Cumulative Effects

The cumulative impacts on economic and social aspects of the environment are a present net value of $596.4 million. An additional 2100 jobs and $33.1 million in income would be generated by this alternative when compared to averages from the past ten years.

This alternative would have a heavy impact on nearby communities with a high percentage of forest products workers. This alternative's emphasis on roaded recreation and visual management would tend to benefit residents of metropolitan Portland and visitors from more distant areas. These groups tend to use the Forest's amenities and do not rely on commodities for employment. This and two other high-amenity alternatives, H and I, would increase the attractiveness of the Forest for people beyond the area of influence.

Alternative H

Direct Effects

The direct effects of alternative H would be $89.1 million total government expenditures for the 150-year planning period, discounted at four percent. Table IV-30 shows these expenditures broken out by resource area.

Indirect Effects

These effects would include an average annual timber sale volume of 108 MMBF in the first decade. By the end of the first decade, the Forest would be providing 12.6 million RVDs for recreation and 577 WFUDs for fish and wildlife. Total benefits (discounted at four percent for a 150-year period) would equal $620.4 million. Payments to counties would decrease from the current level of $9.7 million to a total of $3.8 million.

Cumulative Effects

The cumulative impacts on economic and social aspects of the environment are a present net value of $405.5 million. An additional 1500 jobs and $17.4 million in income would be generated by this alternative when compared to averages from the past ten years.

Recreation employment and opportunities for unroaded recreation would increase, but road construction would be reduced, decreasing roaded recreation opportunities.

This alternative would have a heavy impact on nearby communities with a high percentage of forest products workers. This alternative's emphasis on roaded recreation and visual management would tend to benefit residents of metropolitan Portland and visitors from more distant areas. These groups tend to use the Forest's amenities and do not rely on commodities for employment. This and two other high-amenity alternatives, F and I, would increase the attractiveness of the Forest for people beyond the area of influence.

Alternative I

Direct Effects

The direct effects of alternative I would be $88.1 million total government expenditures for the 150-year planning period, discounted at four percent. Table IV-30 shows these expenditures broken out by resource area.

Indirect Effects

These effects would include an average annual timber sale volume of 165 MMBF in the first decade. By the end of the first decade, the Forest would be providing 12.0 million RVDs for recreation and 587 million WFUDs for fish and wildlife. Total benefits (discounted at four percent for a 150-year period) would equal $821.0 million. Payments to counties would decrease from the current level of $9.7 million to a total of $5.8 million.

Cumulative Effects

The cumulative impacts on economic and social aspects of the environment are a present net value of $613.7 million. An additional 2200 jobs and $36.9 million in income would be generated by this alternative when compared to averages from the past ten years.

This alternative would have a heavy impact on nearby communities with a high percentage of forest products workers. This alternative's emphasis on roaded recreation and visual management would tend to benefit residents of metropolitan Portland and visitors from more distant areas. These groups tend to use the Forest's amenities and do not rely on commodities for employment. This and two other high-amenity alternatives, F and H, would increase the attractiveness of the Forest for people beyond the area of influence.

Alternative Q

Direct Effects

The direct effects of alternative Q would be $110.5 million total government expenditures for the 150-year planning period, discounted at four percent. Table IV-30 shows these expenditures broken out by resource area.

Table IV-30 Total Costs by Alternative MM$[1]

	Alternative							
	NC	A	C	E	F	H	I	Q (Preferred)
Capital Investments								
Recreation	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Trails	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8
FA & O	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Timber Roads	21.1	14.7	18.7	16.1	11.1	7.7	7.6	14.1
Total	31.6	25.2	29.1	26.5	21.4	18.2	18.1	24.6
Timber Operations								
Sales	21.1	14.7	18.6	16.0	11.0	7.8	7.7	14.1
Brush Disposal and Site Preparation	5.8	4.0	5.1	4.4	3.0	2.1	2.1	3.9
Reforestation and Timber Stand Improvement	19.7	13.7	17.4	14.9	10.2	7.2	7.1	13.1
Total	46.6	32.4	41.2	35.3	24.3	17.2	16.9	31.0
Other Operations								
Recreation	14.2	13.6	14.2	13.6	11.3	10.7	10.1	11.9
Wildlife & Fish	10.7	9.3	11.4	7.8	7.1	7.1	7.1	7.1
Range	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Soil, Air, Water	5.6	4.9	5.9	4.1	3.8	3.8	3.8	3.8
Minerals	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Lands	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Facilities	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1
Protection	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1
Insect and Disease Control	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.1
General Administration and Overhead	18.5	18.5	18.5	18.5	18.5	18.5	18.5	18.5
Total	54.9	54.9	54.9	54.9	54.9	54.9	54.9	54.9
TOTAL ALL COSTS	140.8	117.5	134.0	119.6	100.1	89.1	88.1	110.5

[1] *All values 1982$ discounted at 4 percent over 150 years.*

Indirect Effects

These effects would include an average annual timber sale volume of 189 MMBF in the first decade. By the end of the first decade, the Forest would be providing 11.7 million RVDs for recreation and 587 million WFUDs for fish and wildlife. Total benefits (discounted at four percent for a 150-year period) would equal $869.5 million. Payments to counties would decrease from the current level of $9.7 million to a total of $6.4 million.

Cumulative Effects

The cumulative impacts on economic and social aspects of the environment are a present net value of $676.3 million. An additional 2500 jobs and $45.1 million in income would be generated by this alternative when compared to averages from the past ten years.

This is the Forest Service preferred alternative. It attempts to meet all the concerns identified in the planning process. Because it is a balanced alternative, it could generate conflict between those groups who have sharply contrasting views on how the Forest should be managed.

Conflicts Between the Effects of the Alternatives and Others' Plans and Policies for Communities

There are no conflicts.

Mitigation Measures for Communities

Although total jobs would increase in the first decade under all alternatives, there would be a decrease in jobs related to the wood products industry under all alternatives but NC and E. This could result in negative impacts to some of the small, relatively isolated communities around the Forest where the wood products industry employs a large percent of the population. The mitigation measures presented here are aimed largely at these communities.

One possibility for reducing the impacts of declining harvest levels, as provided in Alternatives A, C, F, H, I, and Q, would be to reduce gradually the log flows to communities relying on timber. A gradual reduction in harvest levels would lessen the shock of a change in the communities' economic structure and give people time to plan for coming employment and income changes. The effectiveness of gradual reduction can be inferred by looking at the components of more abrupt economic shocks to mill communities. One study indicates that the suddenness of plant closures is a major factor in the intensity of economic dislocations (Weeks, 1982). If this is the case, then phased reduction of harvest levels would partially mitigate impacts on communities. The major drawback to this type of mitigation is that a gradual reduction in harvest in the beginning of the first decade of the plan (by initially maintaining it above the planned decade average) would necessitate that harvest be reduced below planned levels in the latter part of the first decade to compensate. This is called a departure from non-declining even flow, and is a part of Alternative E.

A number of mitigation measures are available to communities faced with declining supplies of raw materials. Although these measures are beyond the control of the Forest, they are listed briefly here.

Other forest owners presently supply about 35 percent of the wood for mills in the area of influence. These owners may increase supplies to area mills contingent on a variety of factors. Major variables affecting these sources would be price and the availability of timber at the time of demand.

Mills unable to make a satisfactory profit for a corporate owner may be able to operate under an employee buy-out and thereby provide jobs and income to the community.

Unemployment compensation, dislocated worker programs, and retraining programs may mitigate the problems faced by people out of work due to changes in harvest levels.

Some communities may change emphasis by promoting service employment.

Incomplete or Unavailable Information on Communities

None.

Range Management

Introduction

The Mt. Hood N.F. has historically provided forage for domestic livestock. Permitted use has fluctuated over the last 95 years from a high of 47,000 AUM's in the 1920s to a current level of 5700 AUM's. One objective of the Forest's range program is to manage rangeland vegetation with domestic livestock without incurring unacceptable environmental damage to soil, water, or wildlife habitat. Opportunities exist to use livestock as a tool to control competing or unwanted vegetation within tree plantations and/or to prepare a site for planting. The majority of available forage for livestock is produced on transitory range. Another objective is to prevent establishment or control spread of noxious weeds.

Significant Interactions

The management activities described in the various alternatives would have direct and indirect effects on range vegetation. The alternatives will effect the availability, condition, and amount of permanent & transitory range.

The quantity of transitory range will increase in alternatives which call for higher levels of timber harvest. The distribution of livestock may need to be modified to utilize transitory range.

Riparian areas & some stream channels are sensitive to physical damage such as trampling and compaction. The vegetation in these areas is an important component of stream bank stability, and fish and wildlife habitat (see Water and Aquatic components of this chapter). To accomplish these resource objectives, modification of livestock grazing practices could be required.

Changes in commercial livestock grazing may occur in response to increased recreational use. Public dissatisfaction with the presence of livestock in popular recreation areas could require changes in allotment boundaries and livestock management.

Sections of the Badger-Jordan Wilderness area fall within the boundaries of two grazing allotments which had permitted use prior to establishment of the wilderness and will continue to be grazed.

Noxious weeds can adversely affect food production, wildlife habitat, visual quality, forage production, reforestation, recreational opportunities, and land values. Virtually every acre of land is susceptible to noxious weed infestation. Those alternatives creating more acres of ground disturbance will have the highest likelihood of increasing noxious weed infestations.

Deer and elk forage needs are accounted for when determining carrying capacity and allowable use by livestock. If conflicts do occur, allotment plans will be modified to ensure satisfactory range conditions.

Related ICOs

- Noxious weed control.

Environmental Effects of the Alternatives

Alternative C, E, A, and NC

Direct and Indirect Effects

Alternatives which harvest the greatest number of acres will have the potential to produce the greatest amount of forage. Alternatives C, E, A, & NC meet this description. Alternatives which harvest the greatest number of acres also have the potential to create the largest amount of disturbance. This can lead to infestation of noxious weeds which can be difficult to eradicate & may spread to undisturbed grounds. Mitigation measures can be taken to decrease the likelihood of infestations. Alternatives C, E, A, & NC will create more acres of ground disturbance than other alternatives.

Creation of transitory range may change as harvested areas become reforested an forage becomes unavailable. Every alternative will produce this effect to some degree. Changes will be made in annual operating plans to reflect transitory range conditions.

Cumulative Effects

An increase in forage production can be expected over time from alternatives C, E, A, & NC. An increase to permitted numbers in second and later decades could occur under alternatives C, E, A, & NC only if other resource concerns and the standards & guidelines for riparian areas could be met.

Loss of productivity could occur under alternatives C, E, A, & NC if noxious weeds were allowed to establish in disturbed areas & left unchecked. A lower likelihood of this occurrence exists under the other alternatives.

Alternatives F, Q, H, and I

Direct and Indirect Effects

Alternatives F, Q, H, & I will harvest fewer acres & therefor create less transitory range for deer, elk, & livestock.

Cumulative Effects

A decrease in forage production can be expected over time from alternatives F, Q, H, & I. Since permitted numbers of livestock are 5700 AUM's with current available capacity just under twice that much (9500 AUM's), it is estimated that no change to permitted numbers would occur during the first decade. During second & later decades a decrease to permitted numbers may occur in alternatives F,Q, H, & I.

Mitigation

Noxious weed infestations can be greatly reduced by some simple mitigation measures. Limiting soil disturbances, inspecting logging & road building equipment prior to use & monitoring disturbed sites for early detection and treatment are effective measures.

Several mitigation measures could be implemented to reduce the effects of grazing on other resources, while maintaining or increasing forage production. These measures are summarized here.

The most important part of mitigating the effects of livestock use on other resources is knowing what end results are expected, setting site-specific objectives, and developing a comprehensive plan to meet these objectives. Understanding the requirements and characteristics of various kinds of grazing animals is essential. A good management plan, *implemented in cooperation* with the permittee, must provide mitigation measures to maintain or enhance forage, water quality, timber, wildlife/fisheries habitat, recreation use, watersheds and soils.

An important requirement is determining current capacity and the amount of grazing use to be allowed, considering the requirements of all other resources on the area. Controlling livestock is equally important. Water should be provided where it is needed. Once water sources are properly located, adequate, well-maintained fences will provide flexibility for managing livestock. Development of livestock trails and driftways provides access over difficult terrain or through heavy cover to areas receiving light or no use. Riding and proper salt placement is helpful to improve proper distribution. Temporary electric fencing can be very effective to provide short-term livestock use of areas, such as timber harvest units of riparian zones. Opportunity for changing the kind of livestock (from cattle to sheep and back to cattle), the class of livestock (from a cow/calf operation to yearlings), the season of use, and/or animal numbers, can provide dramatic shifts in grazing patterns and types of plants grazed. An important point to consider is that grazing is a management tool for improving vegetation, promoting ecological diversity for a variety of other uses, and for meeting other resource objectives (such as site preparation or release in timber management). Livestock can be used as a tool to provide release of tree seedlings from grass competition. Areas can be intensively grazed to reduced fire hazards, or to provide green new grass for foraging geese along shorelines. Livestock can be used to trample seed into the ground for revegetation. Soil compaction is most pronounced when soils are wet. This can be prevented, to some degree, by considering dryness and firmness of soils in addition to vegetational development when assessing range readiness for livestock grazing.

Improvements

Significant Interactions

Effects on improvements from the implementation of land management alternatives are described in this section. Improvements are an important part of the human environment; these include such facilities as roads, trails, developed recreation sites, administrative sites, utility and transportation corridors, water storage developments, and miscellaneous improvements.

Roads, in particular new construction and reconstruction, have significant interactions with nearly all environmental components discussed in this chapter. A multitude of direct, indirect, and cumulative environmental effects on various resources are associated with roads and trails and these are discussed at length under the respective environmental components in this chapter. Significant interactions and their associated environmental effects in this discussion are limited to those that affect the improvements themselves and their management.

Public use of Forest resources along with Forest Service use and protection activities have direct and indirect effects on man-made improvements on the Mt. Hood National Forest. Land allocations which attract people can increase the traffic on existing roads and trails. Vehicles, pack animals, and people cause wear on these facilities and, along with vegetative encroachments into the traveled way, require recurring maintenance to protect the initial investment. When excessive traffic wear resulting from deferred maintenance or storm damage has occurred, reconstruction may be required to provide a suitable facility. Where people will have limited access to a resource use opportunity, a new road or trail could be constructed to satisfy the identified transportation need, e.g., access for recreation, mining, fire suppression, or timber harvesting.

Some roads are closed to meet resource management objectives. Closures are used to discourage or eliminate all use by motorized vehicles over 40 inches in width. And, a few road closures may altogether eliminate traffic where resource sensitivity is of particular concern. The purposes for closures include providing for water quality, erosion control, public safety, reduction of road user conflicts, reduction of maintenance costs, legal mandates, managing recreation opportunity, and protection/management of wildlife and wildlife habitat. Road closures can result in reduced disturbance to big game and help meet demand for increased "quality" hunting experiences. Changes made to accommodate recreation demand could cause closure of existing developed recreation sites or construction of new ones. Closures may be permanent or periodic. Road closures are authorized in the Code of Federal Regulations, Title 36 Part 261.

Related ICOs

- Incorporate consideration of other resource values in road design.
- Develop a system of recreational trails that interconnect with other agencies.
- Develop a program to correct fish passage blockages due to roads.

Environmental Effects and Mitigation

The alternatives and their associated land allocations have varying effects on the quality of access and the improvements found on the Forest. While road construction can have important cumulative effects on a number of resources including soil and water, no significant adverse cumulative effects were found to impact improvements. Forest-wide Standards and Guidelines, as they apply to location, design, operation, and maintenance of facilities, assure that improvements will accommodate their intended use over time. As demand and use changes with time, capital investments can be used to mitigate those changes. An example might be paving a road to accommodate increased recreation traffic. In cases where capital investments are not justified, improvements such as roads or campgrounds might be closed to prevent degradation.

New road construction within the first decade offered by the alternatives range from 309 miles in Alternative C to 74 miles in Alternative H. The long term road system would require 705 miles in Alternative C or 329 miles in Alternative H. These miles are in addition to the present road system. Completion of the system could take up to 5 decades.

Road closures under the alternatives during the first decade would vary from 656 to 1498 additional miles of road for wildlife, recreation, watershed, or road management purposes. As the final road system is attained, the alternatives provide for a proportionate increase in road closures. This varies from a maximum of 958 more miles of road closures to 1757 additional miles of closed roads.

Road reconstruction varies from 142.5 miles (Alternative E) to 57 miles (Alternative H) per year during the first decade. In all decades road reconstruction remains approximately at these levels.

Effects of the Alternatives on the Transportation System Environment

The Forest has developed a road transportation system that allows the flow of timber and minerals to local communities. The transportation system also allows access to major portions of the Forest for timber harvest, hunting, fishing, sightseeing and numerous other activities. Management of resources and programs affects the existing transportation system and determines the need for further development, maintenance, reconstruction and use of roads.

As explained in Chapter III, Forest roads are classified by function and by maintenance level.

The environmental effects are discussed separately by their Direct, Indirect and Cumulative components. The need for mitigation in addition to that described in Chapter II is discussed, and areas where data and information is incomplete are also identified.

Arterial and Collector Roads

Among the alternatives Arterial and Collector System management is essentially the same. Differences occur in two areas. The second, Alternatives with higher recreational outputs result in variations in the type of reconstruction to arterials and collectors to accommodate increased numbers of passenger traffic in a safe and comfortable manner. In alternatives where watershed management and riparian values are the emphasis, some arterials and collectors may be relocated to accomplish objectives for this resource.

The major difference among alternatives regarding the Forest transportation system would be the mileage and management of local roads. Those alternatives with higher commodity production will necessitate the need for increased access in both roaded and unroaded areas and the relocation of existing local roads presently causing resource damage. In alternatives where commodity emphasis is less, new road construction will be less and road management strategies will be implemented to reduce road densities.

Alternatives that promote high recreation use or high commodity production will generate higher traffic volumes. Conversely, lower levels of use or production will reduce traffic volumes. The location of activities, whether dispersed evenly throughout the Forest or concentrated in localized areas, will have a direct affect on traffic volumes on specific roads. When activities in an area are scheduled to occur at a high level for a short duration, followed by periods of non-activity, the intermittent traffic volumes could exceed the acceptable road capacity and may require reconstruction to a higher standard, which has a direct affect on other resources. Therefore, the quantity, the location and the timing of timber and recreation program activities on each alternative have an indirect affect on soil, water, wildlife, and geology.

Recreation

Recreation use on the Forest creates demand for roads to accommodate public travel. The type of recreation use creates different kinds of affects on the road system. Higher recreation volumes create a demand generally, for higher standard roads. Higher standard roads can include features like two lane or wide single lane, higher travel speeds, open to public travel, smoother roadway surfaces, and greater visibility.

Driving for pleasure creates the highest demand of any recreation use for roads open to public travel. For those alternatives which focus on creating the highest amounts of dispersed recreation a portion is associated with driving for pleasure. Demand for roads open for public use creates safety concerns and results in a need for higher standard roads that are well maintained.

Alternatives with the highest number of scenic viewsheds protected has a direct affect on road construction. Since roads often introduce a contrast in line form or color they are either restricted or designed to be screened, this effects the costs of road construction in viewsheds.

Hunting use has a varying affect on roads. Hunting increase the amount of travel on the road system during a portion of the year.

Roads in semi-primitive motorized recreation areas may be maintained as a part of a high-clearance vehicle trail system rather than maintained as a part of the road system. Additionally some roads in semi-primitive motorized recreation areas may also be closed or obliterated to achieve optimum road density levels for this kind of recreation.

Unroaded Areas

The effect of entrance into these areas on transportation is included in the discussion of timber.

The environmental components discussed in this section would directly affect the expansion and management of the Forest transportation system.

For instance, expanding the road network into roadless areas could:

- Change the ROS setting and associated recreational opportunities of these areas resulting in a need to increase road standards.
- Increase erosion and stream sedimentation rates, resulting in more costly road construction surfacing options.
- Increase access for timber management resulting in more miles of road construction and mile of maintenance
- Increase the potential for disturbance of wildlife habitat, resulting in more complex road management strategies for permanent and seasonal road closures
- Increase access to the Forest for woodcutters, anglers, off road vehicle recreational opportunities, and hunters, potentially creating higher traffic volumes, resulting in a need for higher road standards.

Soils and Geology

Soil properties, rock properties, and topography have direct effects on transportation facilities. Availability, location, design, construction, maintenance, reconstruction, and costs of roads are affected by the geological characteristics of the Forest.

The existing Forest development road system is affected similarly in all alternatives. A portion of the road system is on stable soil and rock subgrades with few, if any mass movement failures. Other portions of the road system are on moderately stable, unstable or very unstable soil and/or rock subgrades. The natural affects on roads of the less stable soils/rocks results in an increased incidence of road failure and an increased need for road maintenance. Mass soil movements could result in loss of roadbeds. The frequency of roadbed failure would be higher on less stable soils. Loss of road bed restricts or prohibits the availability of access, either through restrict of road width, or complete loss of the road in the area of mass soil movement. Road reconstruction is required more frequently, and it is more costly on unstable soils. Road maintenance is also more costly on less stable soils.

Road surfaces are typically constructed and surfaced with local rock materials. Low elevation rock resources may be affected by high commodity alternatives depending upon scheduling. Harvest activities scheduled during winter months will require deeper surfacing depths and higher construction costs.

Alternatives focusing on lower commodity outputs may also restrict the amount of land available for rock resource development.

Water Quality/Fish Habitat

In those alternatives which are focused on these resource values there will be less new construction. Those roads which are built will be located to avoid riparian areas. In addition roads presently located in riparian areas may be relocated and reconstructed. Additionally in those alternatives which focus on these resources uses of surfacing materials other than aggregate or native material will increase. This affects the costs of construction, reconstruction and maintenance.

Alternatives which focus on water quality enhancement will result in a proportionally larger amount of road closures or obliteration. This will have a direct effect on road maintenance with fewer miles to maintain. Where roads are obliterated, miles of new construction may increase in future planning periods than alternatives where roads are merely closed and not obliterated.

Structure placed in streams to increase fish habitat may have an indirect affect on bridges or other engineered structures during floods.

Timber

Timber harvest and haul affect the road system. Alternatives producing the highest timber harvests will have the greatest need during the planning horizon for an extensive and well maintained road system.

Timber harvest creates a demand for low standard roads to gain access to timber harvest sites and haul timber from the harvest sites off the Forest. Most road construction on the Forest is in response to timber access needs.

Those alternatives which focus on high commodity production will result in the most miles of local (low standard) road being built. Timber haul has a physical direct affect on roads. Repeated truck trips create wear on road surfaces and can lead to the eventual failure or a need to reconstruct road surfaces.

Scheduling of timber activities in conjunction with recreation activities may have an indirect effect on traffic volumes. When commercial (commodity) haul and recreational traffic use the same roads the combination can generate enough traffic to warrant changes in road standards. This results in wider roads, more construction/reconstruction expense as well as increased maintenance expenses.

Alternatives which produce the greatest quantities of timber haul, also create the largest amounts of cooperative road maintenance funds which are collected from timber purchasers to be used on Forest roads. Therefore, those alternatives which produce higher haul volumes have more funds available for road maintenance. This results in a higher percentage of road miles being adequately maintained to the required standards. Those alternatives which result in volumes lower than historic records will increase the need for congressional budget funds for maintaining roads at historic levels. Lower haul volumes could reduce the need for maintenance or result in reduced road maintenance or limited access in some areas if no replacement funds are provided.

Other indirect effects include increased access for wood cutting, hunting or other forms of motorized vehicle recreation.

Wildlife

Alternatives that promote areas set aside for wildlife management will normally show a decrease in miles of open road, through a combination of road management strategies like permanent or seasonal road closures. These alternatives also will have fewer miles of road constructed than alternatives which focus on high commodity or recreation uses.

Direct and Indirect Effects

Alternatives C, and E

During the first decade, each of these alternatives have similar miles of new construction. Alternative C will add 309 new miles, and Alternative E, 304 miles of road will be added. All miles will be constructed in support of timber sale needs. Ultimately, Alternative C will build 705 new miles and Alternative E, 610 miles will have to be built to satisfy this need. 70% of these new roads will be closed during each period. During the first decade, under Alternative E, reconstruction needs are 143 miles per year. Reconstruction will be required to satisfy user needs and road management objectives. Under Alternative C, 131 miles per year will be required.

Alternatives NC and A

During the first decade, each of these alternatives have similar miles of new construction. Alternative NC will add 247 new miles, and Alternative A, 255 miles of road will be added. All miles will be constructed in support of timber sale needs. Ultimately, Alternative NC will build 679 new miles and Alternative A, 595 miles will have to be built to satisfy this need. 70% of these new roads will be closed during each period. During the first decade, under Alternative NC, reconstruction needs are 139 miles per year. Reconstruction will be required to satisfy user needs and road management objectives. Under Alternative A, 110 miles per year will be required.

A summary of affects on other resources can be found under the following component discussions of transportation: geology, watershed, and soils.

Alternative Q (Preferred)

During the first decade, this alternative will add 166 miles of new construction. All miles will be constructed in support of timber sale needs. Ultimately, under Alternative Q, 527 new miles of road will be built to satisfy this need. 80% of these new roads will be closed during this planning period. During the first decade, under Alternative NC, reconstruction needs are 92 miles per year. Reconstruction will be required to satisfy user needs and road management objectives.

A summary of affects on other resources can be found under the following component discussions of transportation:

- geology
- watershed
- soils

Alternatives F, H and I

During the first decade, Alternatives F and I have similar miles of new construction. Alternative F will add 113 new miles, and Alternative I, 115 miles and Alternative H will add 74 miles of new construction. All miles will be constructed in support of timber sale needs. Ultimately, Alternative F will build 401 new miles and under Alternative I, 433 miles will have to be built to satisfy this need. Alternative H will ultimately build 329 miles of new construction. 90% of these new roads will be closed during each period. During the first decade, under Alternative F, reconstruction needs are 76 miles per year, Alternative I will reconstruct 75 miles and Alternative H, 57 miles. Reconstruction will be required to satisfy user needs and road management objectives.

For summary of affects on other resources can be found under the following component discussions of transportation: geology, watershed, and soils.

Cumulative Effects

Soils and Geology. Over time the cumulative effects of soils and geology on roads are similar to their direct and indirect effects. Mass movements will continue to occur on road locations as a result of the natural instability of the landscape. Sometimes these mass movements will cumulatively necessitate reconstruction or relocation of a road facility. Road surfacing continues to break down over time and is lost through erosion processes.

Timber. Timber harvest and haul cumulative affect the road system. Alternatives producing the highest timber harvests will have the greatest need during this planning horizon for an extensive and well maintained road system.

Recreation. Recreation is projected to increase over time on the Forest. Cumulatively, recreation needs, especially driving for pleasure and developed recreation will require a certain number of roads to be constructed, reconstructed and maintained to a high standard over time.

Wildlife. Cumulative effects of wildlife over time on roads are that certain areas of the Forest will continue to prohibit roads, thus restricting access. Hunting pressures will continue to increase and may have the result of more roads being closed to motor vehicle travel in future decades than is planned in the first decade. This effect, is not known with any certainty.

Mitigation

Standards and Guidelines represent mitigating measures for the transportation system. Design and construction methods incorporating sound geotechnical practice partially mitigate the affects of soil and geology on roads. Slope stabilization, retaining walls, locations avoiding known areas of instability, geotechnical investigation, and surface stabilization measures are all examples of mitigating measures currently being used on the Forest, and that will continue to be used for any of the alternatives.

After mitigation measures used to minimize effects of roads to soil and water include the use of water bars, minimizing the amount of soil disturbed, seeding and mulching cut and fill slopes. Other discussions on mitigation measures can be found under the soil and water component discussions.

Potential Conflicts with Plans and Policies of Other Jurisdictions

Please refer to the end of this chapter for a discussion of the possibility of conflicts between the alternatives and the plans and policies of other jurisdictions with responsibility or authority for this environmental component.

Recreation Opportunities

Introduction

Use of the Forest for recreation can be generally classified as either developed recreation or dispersed recreation. In order to describe potential recreation opportunities as accurately as possible, dispersed recreation has been further divided into roaded or unroaded (non-Wilderness) dispersed recreation.

Discussion of the effects of the Alternatives on recreation focuses on recreation settings. Recreation settings are locations on the Forest exhibiting certain environments that people choose for different recreation experiences. The Recreation Opportunity Spectrum (ROS) describes these settings in terms of types of recreation opportunities they offer. ROS classes are briefly described in Chapter 3. They are: Primitive (P), Semiprimitive Non-motorized (SPNM), Semiprimitive Motorized (SPM), Roaded Modified (RM), Roaded Natural (RN), and Urban (U).

On the Mt. Hood National Forest, primitive opportunities are only provided in Wilderness, and Urban settings are only provided in developed recreation sites.

Significant Interactions

Outdoor recreation activities on the Forest take place in many different settings. The way the Forest is managed can affect, either directly or indirectly, those recreation settings as well as visitors' recreation experiences. The relative mixture of recreation settings and experiences that would be available to Forest visitors would be determined by land allocations to be established by each alternative. Land allocations would also determine to some extent the Forest's capacity for meeting present and future demand for various recreation opportunities.

Impacts to the recreation resource would vary through the range of alternatives. These impacts are the result of management activities that affect the quality of the recreation setting.

Activities such as timber harvests, livestock grazing, mining activities, and wildlife management activities and areas, would all affect the recreation experience by changing the quality of the recreation experience and access to it by varying degrees. The construction and maintenance funding levels of recreation facilities and services under each alternative can also affect recreation opportunities, especially in developed recreation areas. Management of recreation facilities and services includes operating and maintaining campgrounds, trailheads, trails and associated facilities, boat ramps, ski areas, visitor information centers, and parking lots; providing or improving structures or equipment; and providing access to recreation areas.

Related ICOs

- Conflicts between management activities and competing recreation activities
- Maintenance and enhancement of visual quality
- The supply of developed recreation sites
- Ability to meet existing and future demand for developed and dispersed recreation

Direct and Indirect Effects

Developed Recreation Opportunities

Alternatives may affect developed recreation settings in three basic ways: by elimination of sites, by the manner in which individual sites are maintained, and by the type of management that is proposed in areas surrounding individual sites.

The elimination or closure of some developed sites may affect other sites. The users of sites proposed for closure will be displaced into other developed sites, or will seek alternative experiences in dispersed and undeveloped areas. Subsequent effects include: the possible overuse of other developed sites, the loss of a preferred user experience, and the increased potential of human-caused wildfire in dispersed camping sites. In addition, an increase in litter, human waste, vandalism, and related effects can be expected in dispersed sites.

The number of developed sites is about the same in all alternatives. The service level provided, i.e. operation and maintenance of the sites and the administration, and the resulting quality of the recreational experience are at the standard level in all alternatives.

All alternatives emphasize rehabilitation of existing facilities which have deteriorated. Existing developed sites in all alternatives are operated and maintained at Full Service Level. Full service refers to the quality of service provided. Full service level goes beyond meeting the basic health and safety needs of visitors; it means offering a level of high quality services that ensure a pleasant recreation experience for the visitor. Funding, based on recreation site studies will be used to upgrade or expand existing sites operating near capacity. None of the alternatives call for significant net changes in developed recreation use.

Based on current estimates, the Forest will be able to meet overall demand for developed recreation through the year 2040 only by granting concessions and award-

Table IV-31 Total Benefits by Alternative MM$ [1]

	Alternative							
	NC	A	C	E	F	H	I	Q (Preferred)
Recreation and Wildlife	199.1	196.3	199.1	197.7	187.0	205.4	198.6	194.7
Timber	1,230.7	919.8	1,100.0	897.9	619.5	415.0	622.4	674.9
Total	1,429.8	1,116.1	1,299.1	1,095.6	806.5	620.4	821.0	869.6

[1] *1982$ discounted at 4 percent over 150 years.*

ing special permits for private operation of Forest Service owned sites and facilities and by upgrading existing facilities to standard (full service) levels.

Timber harvest and road construction activities in areas surrounding developed sites could affect the setting of those sites and the experience of users if activities affect the developed area or if users venture beyond the sites into the surrounding landscape. In either case, harvest activities can change the character of the surrounding area in a manner that may preclude or alter the quality of experiences and opportunities typically associated with developed site use, or associated use, such as hiking, fishing, sightseeing, and nature study.

Road construction and harvest activities could result in increased sedimentation affecting fish habitat and fishing quality. These activities can also result in a heightened sense of industrial activity in the area from increased noise levels and; therefore, a reduction in the quality of the overall recreation experience.

The alternatives provide a high degree of protection for the settings of existing developed recreation sites from surrounding management influences. Most sites are surrounded by management areas that permit only low levels of harvest and road development and, are therefore, buffered from the normal effects of forest industrial operations. Alternatives A, NC, E, and C provides the least protection for developed settings from surrounding influences, while Alternatives F, G, H, and I provide the most.

Another facet of developed recreation that does change by alternative is the allocation of approximately 1,040 acres of the Zigzag summer home tracts to A10-Developed Recreation. The Zigzag summer home area is allocated to A10 in Alternatives C, F, H, I, and Q. Under these alternatives, timber harvest would not be allowed in the prescription; therefore, protecting the existing setting of the summer homes. Alternatives A, NC, and E allow timber harvest in the summer home tracts which could result in significant changes in the scenic quality of the area.

Table IV-32 Percent of Demand Supplied in Year 2040 by ROS Class (Percent)

	Alternative							
	NC	A	C	E	F	H	I	Q (Preferred)
P	16	16	16	16	16	16	17	16
SPNM	8	13	10	16	23	17	25	18
SPM	6	4	1	3	5	<1	1	4
RN	44	66	43	78	102	135	151	102
RM	188	400	189	119	60	44	7	71
R	8	8	8	8	7	10	7	8

Dispersed Recreation Opportunities

The alternatives vary as to the quality of the recreation experience, and the quality of access provided because of the levels of demand met for dispersed recreation in particular ROS settings as shown in Table IV-32.

In addition, alternatives with higher levels of activity for other resources, such as timber harvesting, can affect the recreation environment, and resulting quality of experience. Indirect effects, such as temporary loss of trails or access changes will occur with those alternatives that involve higher levels of ground disturbing activities.

The ability to meet projected primitive (P) ROS setting demand remains the same in all alternatives except I. Primitive recreation opportunities are only available in designated wilderness. Wilderness acreage and the approximate 144,000 RVDs is provided in Alternatives A, NC, C, E, F, Q and H. These 144,000 RVDs will meet approximately 16% of the demand through year 2040. Alternative I recommends an additional 7770 acres (approximately 7000 RVDs) of the Olallie Roadless Area to be designated as wilderness. With this addition, Alternative I would meet approximately 17% of the Primitive ROS demand through the year 2040.

Projected demands for dispersed recreation opportunities described as Semi-Primitive Nonmotorized (SPNM) and Semi-Primitive Motorized (SPM) would exceed the supply in any of the alternatives. However, the alternatives vary considerably in the dispersed unroaded recreation opportunities that would be offered.

The availability of SPNM and SPM recreation opportunities would depend on whether a number of currently unroaded areas, such as Roadless Areas, Special Interest Areas, or other undeveloped areas would be managed for other resource development. Alternatives F, H, and I, which strongly emphasize unroaded recreation opportunities, would provide the greatest opportunities for SPNM types of recreation activities. Alternatives A, NC, and C emphasize Roaded Modified (RM) settings, i.e., commodity development, and would therefore offer the least opportunity for unroaded recreation. Alternatives D and E would occupy the middle of this spectrum.

The SPNM settings managed for Roaded Natural (RN) and RM opportunities will, in 5 to 10 years, be altered dramatically by roads and harvest units, and thus be unable to provide for user needs of isolation, solitude, and primitive type recreation in an un-modified natural environment. Through alteration of landforms and vegetation in SPNM settings, areas for this opportunity type would become diminished in size, quality, and use capacity. The sights and sounds of industrial forest management, such as logging traffic and harvest activities, will be prevalent and in near proximity, resulting in a loss of isolation and solitude normally associated with unconfined recreation in SPNM settings.

All alternatives provide nearly equal amounts of Semi-Primitive Motorized (SPM) opportunities. As SPM settings are converted to RN and RM settings, primarily through timber harvest and road construction, use opportunities for challenging motorized access to unroaded and undeveloped areas become limited or are lost. Typically, road development associated with timber harvest activities shortens access routes, bisects or replaces trail access, and improves road surfaces, thus altering or eliminating previously difficult or challenging semi-primitive motorized recreation opportunities.

Roaded Natural and Roaded Modified settings provide the greatest opportunities for dispersed roaded recreation and dispersed motorized recreation. The major difference between RN and RM is the evidence of management activities associated with each. The frequency and design characteristics of management activities in the RM setting will result in an obviously altered, rather than a natural appearing landscape typical of the RN setting. Alternatives Q, F, H, and I have the most favorable effect on the RN setting, and Alternatives A, NC, C, and E have the least favorable effect. Conversely, Alternatives A, C, NC, and E provide the greatest effect on the RM settings, while Alternatives F, Q, H, and I provide the least. The natural appearance of the RN setting would change through alteration of vegetative cover and landforms as a result of timber harvest and road construction. In areas of this setting allocated to RM opportunities the effects of road construction and harvest activities such as exposed soil on steep slopes, cut-banks, and un-natural vegetation patterns will be apparent.

Under all of the alternatives the existing trail system is improved and expanded. Approximately 13 miles of trail will be constructed, and 61 miles reconstructed per year under all alternatives. Existing trails will be reconstructed to meet standard levels of service.

Road construction and timber harvest will continue to obliterate and effect the quality of portions of some trails. Trails which traverse management areas having high incidence of timber harvest and road construction are more subject to the effects of replacement and bisection by roads, and the encroachment of management activities on the visual experience of trail uses than management areas with a lower incidence of these activities.

The removal of trees along trails through various harvest methods and associated post harvest practices will alter the basic character of trail settings and may displace trail use. During harvest and post harvest operations affected trail segments may become impassable or destroyed. The felling of trees, yarding, and residue treatment activities can block access or users and destroy or disturb trail surfaces. These effects will typically result in closures of affected trail segments, trail relocations, and reconstruction of disturbed trail surfaces.

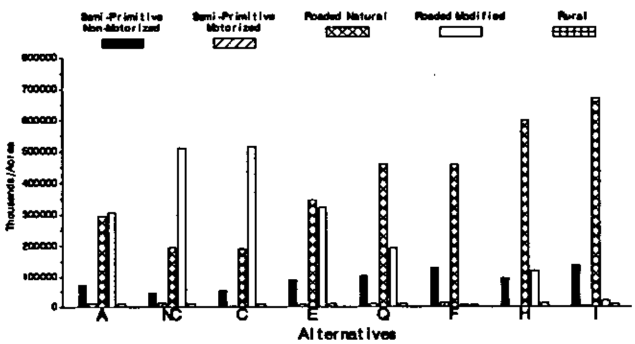
Road construction continues to have the greatest effect on the Forest trail system. As the Forest road network expands, more and more trails will be bisected or replaced. Bisection of trail interrupts an otherwise continuous trail-related experience or opportunity of both motorized and nonmotorized use. Often roads that bisect trails result in a shortened distance to a trail's destination. Trail replacement through road construction often results when a new road actually occupies the same grade and alignment of a trail, obliterating any evidence of its existence and providing access to the same destination.

A further consequence of replacement and bisection of trails, is the loss of trail related recreation opportunities and displacement of trail users. Extension of the Forest's road system has and may continue to shorten acess and attract more use to many special areas and natural features resulting in increased compaction, displacement, and erosion of trail surfaces. In addition, as trail mileage is reduced from bisection and replacement, competition among mountain bikers, hikers, motorized trail bike users, and pack and saddle users for exclusive use is likely to increase.

Alternatives NC, C, A, and E will have the greatest effect on trails due to the high level of timber harvest and associated road construction. Alternatives F, Q, I, and H will have the lease effect on the quality of the trail system. The negative impacts should be lessened through mitigation by the disturbing activity (see Forest-wide Transportation, Travel, and Access S&Gs, Forest Plan).

Table IV-33 and Figure IV-34 show the distribution of the Forest's area across the Recreation Opportunity Spectrum (ROS) described in Chapter III.

Figure IV-34 Dispersed Recreation Opportunity Spectrum (In Year 2040)



*Doesn't include Wilderness, Bull Run, and Urban Areas

Table IV-33 Dispersed Recreation Opportunity Spectrum Acres by Year 2040[1] (Acres by ROS Category by Alternative)

	Alternative							
	NC	A	C	E	F	H	I	Q (Preferred)
P	185,972	185,118	187,418	185,434	186,031	187,631	196,666	186,031
SPNM	45,180	71,801	57,524	88,172	130,017	94,601	138,775	103,435
SPM	15,055	11,258	1,900	8,082	13,832	813	3,483	10,802
RN	195,066	294,943	190,908	346,012	459,210	599,809	671,201	458,447
RM	510,222	388,408	514,188	323,106	164,102	119,479	20,212	192,084
R	10,780	10,778	10,858	10,957	9,329	12,650	9,487	10,689
U	1,691	1,691	1,717	1,642	1,714	1,714	1,714	1,707

[1] *The Bull Run will not be available for public access under any of the alternatives considered.*

Cumulative Effects on Recreation Opportunities

Cumulative effects of alternative activities on dispersed recreation would relate mainly to the development of areas which currently offer Primitive, and Semi-Primitive, Nonmotorized recreation opportunities. Alternatives which would allocate existing unroaded areas for timber harvesting and other resource development activities gradually reduce opportunities for dispersed recreation in an unroaded setting. The rate that unroaded areas would be developed indicates how soon the recreation opportunities in a particular area would be modified from a Primitive or Semi-Primitive, Nonmotorized setting to a Roaded Natural or Roaded Modified setting. Appendix C, FEIS, Roading of Roadless Areas, compares the maximum percent of each unroaded area which can be harvested in the first decade under the provisions of each alternative. As shown by the relative amounts of harvest, Alternatives A, NC and C would reduce unroaded recreation opportunities much more rapidly than the other alternatives would. Although some alternatives allocate various unroaded areas for unroaded prescriptions, none would be able to meet total demand for Primitive and Semi-Primitive, Nonmotorized recreation opportunities.

Through expansion and improvement of the Forest trail system, users will be provided with improved, safer trails, and with new trails which will provide more recreation opportunities. Existing trails which currently have resource or safety problems will be corrected through time by all alternatives. Alternatives E, H, and I will bring about changes more quickly than other alternatives.

Mitigation

Measures to mitigate the effects of various management activities on developed and dispersed recreation facilities and services are prescribed in Chapter 4 of the Forest Plan, and in the standards developed for individual Management Areas. Most mitigation measures are linked to the level of funding for developed and dispersed recreation facilities and services. Funding does not vary by alternative.

The effectiveness of mitigation for dispersed recreation revolves around proper designing and timing of other activities in dispersed recreation areas. Rehabilitation of sites disturbed by logging or road construction can mitigate long term effects on these sites.

Wild and Scenic Rivers

Introduction

The Wild and Scenic Rivers Act of 1968 (Public Law 90-542 as amended) established a method for providing federal protection for certain of our remaining free-flowing rivers, and preserving them and their immediate environments for the use and enjoyment of present and future generations. Rivers are included in the system so that they may benefit from protective management and control of development for which the Act provides.

Numerous river corridors in the Forest draw increasing numbers of users annually because of their special attributes and some have gained both State-wide and National attention. As a result of the Omnibus Oregon Wild and Scenic Rivers Act of 1988, the Clackamas, Roaring, Salmon, Sandy and White Rivers were added into the National Wild and Scenic River system. The North Fork Clackamas River, a portion of the South Fork Clackamas River, and the mainstem of the Clackamas River on the Forest have also been designated State Scenic Waterways in 1988 through the Oregon Rivers Initiative.

In response to public input to the DEIS, 12 additional rivers were studied as potential Wild and Scenic Rivers. These rivers were:

- West Fork Hood River
- Middle Fork Hood River
- East Fork Hood River
- Zigzag River
- Eagle Creek (Clackamas County)
- North Fork Clackamas River
- South Fork Clackamas River
- Fish Creek
- South Fork Roaring River
- Oak Grove Fork Clackamas River
- Collawash River
- North Fork of North Fork Breitenbush River

Of these 12, all or portions of 11 were determined to be eligible for Wild and Scenic River status. The West Fork Hood River was not found eligible. One of the eligible rivers, the East Fork Hood River, was further evaluated for its suitability as a Wild and Scenic River. More detailed discussion on the eligibility and suitability analysis on the above rivers is contained in Appendix E.

Significant Interactions

Land allocations adjacent to the designated Wild and Scenic River corridors as well as the allocations that include and are adjacent to eligible river corridors have the potential to impact Wild and Scenic river attributes. Depending upon the specific land allocations within the alternatives, the potential for effects varies greatly. These effects can affect the quality of recreation experiences greatly as well as impact other resource values. Timber harvest, road construction, and other related activities, as well as other facility construction are the management activities within any of the alternatives that would have the greatest effect on the quality of the river experience and the inherent attributes. The degree of visual resource protection offered in the viewsheds adjacent to the rivers becomes one of the means to evaluate acceptable level of activity. Resource activities are mitigated through the use of Standards and Guidelines applicable to the protection of the river, its values, and visual resources.

Wild and Scenic River designations have an immediate effect on water quality standards too, through change to the more restrictive anti-degradation policy applied by the State of Oregon.

Management plans for the 5 nationally designated rivers have not yet been completed. Analysis of effects on alternative ways of managing those rivers will not occur in this analysis and documentation but is scheduled for completion within the next 3 years under separate documents. Analysis of the suitability of the remaining eligible rivers is scheduled for completion within the next 5 years.

Related ICOs

- Wild, scenic, and recreational rivers.
- Maintain quality of existing scenery and rehabilitate degraded scenery.

Effects of the Alternatives on Wild and Scenic Rivers Environment

The setting of a wild and scenic river provides for a wide range of recreational opportunities which are enhanced by the river's free-flowing condition, its outstandingly remarkable values and the quality of its surrounding environment. As required by the Wild and Scenic River Act, the area within designated river corridors will be managed to protect, and where possible, enhance the river's outstandingly remarkable values, and protect its free-flowing condition and designated classification. The act also requires that eligible/suitable rivers be managed in such a way that the values which caused them to be found eligible/suitable be protected until they are found not suitable or are released from further consideration by Congressional action.

Below, by alternative, are estimates of effects on Wild and Scenic Rivers.

Alternatives A and NC

Direct Effects

For the 5 designated rivers, current landscape character would be maintained within the 1/2 mile wide corridor. The Roaring River would remain naturally appearing outside the corridor for its length. Outside the river corridor along portions of the Clackamas, Salmon, Sandy, and White Rivers, the landscape will appear moderately altered where intensive timber harvest activities take place. For all the designated rivers, the identified outstandingly remarkable values would be protected to the extent that they are not impacted by management activities outside the river corridor.

For the eligible rivers, alternative A would maintain the current landscape character throughout the corridor and area seen from the river and main travelways along the river. The river's free-flowing character, potential classification and outstandingly remarkable values will continue to be protected unless they are found not suitable or are released by Congressional action.

Alternative NC, fails to protect the free-flowing conditions and outstandingly remarkable values of eligible rivers in the Forest from development activities. In this alternative, activities may take place that could potentially make a river ineligible or reduce its classification. These rivers are protected only to the extent that portions of them are contained in other management allocations, the management direction of which would provide some level of protection to river values.

Neither alternative recommends the East Fork Hood River for designation as a Wild and Scenic River. The Winter Recreation allocation in segment 2 of the river would allow some impact to the identified outstandingly remarkable value for that segment. The allocation to scenic viewshed along segment 3 of the river would protect most, if not all of the segment's important river values.

Alternative C

Direct Effects

For the 5 designated rivers, current landscape character would be maintained within the 1/2 mile wide corridor. Outside the corridors, the landscape will appear moderately altered along their entire lengths due to intensive timber harvest. For all the designated rivers, the identified outstandingly remarkable values would be protected to the extent that they are not impacted by management activities outside the river corridor.

For the eligible rivers, this alternative would maintain the current landscape character throughout the corridor and area seen from the river and main travelways along the river. The river's free-flowing character, potential classification and outstandingly remarkable value will continue to be protected unless they are found not suitable or are released by Congressional action.

This alternative does not recommend the East Fork Hood River for designation as a Wild and Scenic River. The Winter Recreation allocation in segment 2 of the river would allow some impact to the identified outstandingly remarkable value for the segment. Intensive timber harvest along the river in segment 3 would reduce important recreational values along that segment of the river.

Alternative E

Direct Effects

For the 5 designated rivers, current landscape character would be maintained within the 1/2 mile wide corridor. Portions of the Forest adjacent to all 5 rivers would be allocated to intensive timber harvest and in those areas, the landscape will appear moderately altered. Other areas along those rivers are placed in more restrictive allocations and the current landscape character would be maintained. For all these rivers, the identified outstandingly remarkable values would be protected to the extent that they are not impacted by management activities outside the river corridor.

For the eligible rivers, this alternative would maintain the current landscape character throughout the corridor and area seen from the river and main travelways along the river. The river's free-flowing character, potential classification and outstandingly remarkable value will continue to be protected unless they are found not suitable or are released by Congressional action.

This alternative does not recommend the East Fork Hood River for designation as a Wild and Scenic River. The Winter Recreation allocation in segment 2 of the river would allow some impact to the identified outstandingly remarkable value characteristics for the segment. The allocations along the river in segment 3 would protect most, if not all of the segment's important river values.

Alternatives F, H, I, and Q (Preferred)

Direct Effects

For both designated and eligible rivers, these alternatives would maintain or improve the current landscape character throughout the river corridor and the area seen from the river and main travelways along the river. For the designated rivers, identified outstandingly remarkable values, including scenic values, will be protected beyond the designated river corridor. Eligible river's free-flowing character, potential classifications, and outstandingly remarkable values will continue to be protected unless they are found not suitable or are released by Congressional action.

Alternative I has the greatest potential of all the alternatives to improve the current landscape character. This is because this alternative allocates more of the Forest and eligible river corridors to more protective allocations allowing the greatest opportunity for currently impacted areas to return to a naturally appearing condition.

Alternatives F and I recommend the East Fork Hood River be designated as a Wild and Scenic River and the river's free-flowing character, recommended classifications, and outstandingly remarkable values would be protected unless the released from protection by Congressional action.

Alternatives H and Q do not recommend that the East Fork Hood River be designated as a Wild and Scenic River. The identified outstandingly remarkable value for the river in segment 2 does receive protection through a Special Interest Area allocation. In segment 3 of the river, management direction in alternative allocations along the river protect most, if not all, river values.

Indirect Effects

Indirect effects of management activities associated with these alternatives include timber harvest and related activities, effects of recreation users on various resources, effects of other resource restoration and enhancement projects,and mineral development. These effects are common to all alternatives and are not expected to vary except by intensity of effects.

Cumulative Effects on Wild and Scenic Rivers

For alternatives F, H, I, and Q, no cumulative effects on designated Wild and Scenic Rivers outstandingly remarkable value's are anticipated because the standards and guidelines require that those values be protected and/or enhanced including the visual character outside the river corridor as viewed from the river and main travelways along the river. The river's free-flowing character and classification will be protected in all alternatives. River specific management plans scheduled for completion within three years will provide further direction to protect and/or enhance river values.

For alternatives A, C, E, and NC, the landscape character outside the corridor as viewed from the river or main travelways along the river would be degraded through time as intensive timber harvest takes place within areas outside the river corridor.

For all alternatives except alternative NC, no cumulative effects on eligible Wild and Scenic Rivers are anticipated because the river's outstandingly remarkable values, its free flowing character, and potential classification will be protected. This also applies to those eligible rivers found suitable in subsequent studies since those suitable rivers and associated values will be protected until there is congressional action on those rivers found suitable. For alternative NC, a variety of activities may change the values and characteristics necessary for Wild and Scenic river classification and limit the rivers future consideration for inclusion into the National Wild and Scenic Rivers system.

For rivers not found eligible/suitable, the cumulative effects of a variety of activities may change the values and characteristics necessary for Wild and Scenic river classification and limit the rivers future consideration for inclusion into the National Wild and Scenic Rivers system.

Mitigation

The direction set forth in the standards and guidelines for all designated, eligible, and suitable rivers provide the basis for protection of a river's free flowing character and values for which it was designated or found eligible. Use of the standards and guides, as well as additional direction that will be developed in the management plans for the designated rivers, can provide for the establishment of carrying capacities for managing use levels and mitigating effects. The effects of crowding on campsites and trail systems can be reduced by substituting facilities and dispersing recreation use. Access to the river corridors, provided by the construction and maintenance of signs and trails, will govern the location and degree of effects to these areas from public use.

Some management practices can be employed to ensure that effects of vegetation manipulation remains subordinate to the general scene of the area. These practices include: adjustments in the size and location of timber harvest units and created openings; the regulation of harvest rates; the use of uneven-aged management practices, such as group selection or individual tree selection; handpiling and burning of harvest debris; immediate reforestation of disturbed sites; and locating roads to be visually inconspicuous from the river surface and riverbanks.

Wilderness

Introduction

The environmental qualities of naturalness and solitude will continue to characterize designated Wilderness, although as a consequence of implementing any of the proposed alternatives there will be change within acceptable levels, in some aspects of Wilderness settings. Wilderness will continue to provide a range of recreation opportunities that interweave the physical and biological features of water, air, soil, geology, vegetation, fish and wildlife with particular social factors such as isolation, remoteness and personal challenge.

The Wilderness Act of 1964 states that Wilderness is to be managed in such a manner "devoted to the public purposes of recreational, scenic, scientific, educational, conservation and historical use" only to the extent that the essential wilderness character of the area is protected. Managers are faced, therefore, with the problem of accommodating human use yet preserving an area's wilderness quality.

Given that any use of the environment produces at least some impact, managers must identify where, and to what extent, varying degrees of change are appropriate and acceptable within wilderness settings. This is accomplished through the use of the Wilderness Resource Spectrum (WRS) system. Wilderness settings are characterized within the WRS as Pristine, Primitive, Semiprimitive and Transition classes. For a description of WRS classes refer to Chapter III, Wilderness.

Significant Interactions

Changes in WRS classifications result primarily from resource conditions affected by the amount and type of user activities and the inside of designated Wilderness.

Although activities, such as timber harvest, can cause localized effects near wilderness boundaries, the most significant effects on wilderness settings are relative to access and the amount and type of recreation use that a particular area receives.

Roads provide access to wilderness settings, and trails facilitate and organize recreation use within designated Wilderness. Trails allow people to take advantage of primitive and un-confined types of recreation opportunities. An extensive trail system can result in fewer contacts between users but could cause increased effects to physical and biological aspects of the environment. Increased access can also cause overuse of desirable campsites and attractions. For example, pack and saddle users need water and meadow areas for maintaining their stock, and tend to utilize large campsites. Commercial outfitters and guides may introduce large groups to some wilderness settings, affecting the solitude and isolation of individuals or smaller groups of users.

Mt. Hood Wilderness, Westside

Each Wilderness within the Forest displays a range of WRS conditions. For example, at major entry points to wilderness, such as Ramona Falls Trailhead in the Mt. Hood Wilderness, use levels are relatively high, with frequent contact between parties. Areas of Wilderness, such as Ramona Falls Trailhead, would be classified in the Transition WRS class and resource effects would be moderately evident. Elsewhere, within Forest Wildernesses there are places where few people visit and natural conditions remain undisturbed. The primitive WRS classification would apply to these undisturbed areas. Between these opposing ends of the WRS is the Semiprimitive class, which apply to the intermediate conditions of use and resource quality of wilderness.

Related ICOs

- Dispositions of remaining roadless areas.
- Managing Wilderness in proximity to urban areas

Direct and Indirect Effects

Three factors that vary by alternative with respect to their consequences on Wilderness are: the recommendation of adding acreage to the Wilderness Preservation System; the establishment of WRS management classes and their subsequent projected recreation use; and increased access through road construction and harvest activities along Wilderness boundaries.

Below, by alternative, are estimates of effects on Wilderness:

Factor 1: Acreage added to Wilderness Preservation System?

Alternatives A, C, NC, E, F, Q, and H do not propose any acreage additions to the Wilderness Preservation System. All of these alternatives have the same wilderness land base, and therefore the same 144,000 recreation visitor days (RVDs) carrying capacity.

Alternative I recommends addition of the Olallie Lakes area (9470 acres) to the Wilderness Preservation System. This would provide at least 7000 RVDs additional carrying capacity to the Wilderness system.

Factor 2: Wilderness Resource Spectrum (WRS) and Projected Recreation Use.

Designation of WRS classes within each wilderness allows for management of wilderness settings for differing experiences and recreation use capacities. WRS classifications are based on measurable criteria which describe the social, biological, and physical characteristics of the area. The three WRS classifications or zones in the Wilderness Areas on the Mt. Hood National Forest are primitive trailed, semi-primitive trailed, and transition (see Chapter III, FEIS for detailed description). The amount and distribution of these zones within a wilderness varies according to the level of recreation use the area receives. Since demand for primitive and semi-primitive recreation settings is predicted to increase, that propose roading of the existing non-wilderness unroaded areas will more than likely precipitate increased user pressure on existing Wilderness settings, and therefore, alter the WRS zones. As user pressure increases, WRS zones shift from primitive to semi-primitive and transition classes. This type of shift is accompanied by a decreased wilderness experience.

Alternatives A, C, NC, and E road eight of the eleven existing unroaded areas in the first decade. This will result in additional recreation pressure on wilderness to supply the demand for semi-primitive and primitive opportunities, which will in turn cause a shift from primitive trailed to semi-primitive trailed and transition WRS acres. This results in less chance to find relative opportunities for solitude.

Alternative Q would road six of the eleven roadless areas, again resulting in a shift from primitive WRS to semi-primitive and transition settings. Although, the shift would not be as great as with alternatives A, C, NC, and E.

Alternatives F, H, and I would maintain eight and nine of the eleven roadless areas respectively. The resulting shift in WRS acres from primitive to semi-primitive and transition would be much less than the other alternatives, and therefore, the quality of wilderness experience could be maintained longer.

Factor 3: Increased access through road construction and harvest activities along wilderness boundaries.

Other activities, external to Wilderness, that have potential to effect the Wilderness environment, its integrity, and its use, include road construction and timber harvest. Road construction and timber harvest can have a dramatic effect on both the amount and character of Wilderness use. Locating roads and harvest units along or in near proximity to the Wilderness boundary can increase the number of possible entry points, result in user developed trail systems, and increase access to areas of high public interest and use. In addition, harvest areas can alter the wind firmness of adjacent Wilderness timber stands, and may reduce scenic quality experiences of adjacent areas as viewed from within Wilderness.

Alternatives that road adjacent unroaded areas, or emphasize timber harvest are expected to have the greatest incidence of these effects. Of the eleven existing roadless areas, seven are adjacent to wilderness boundaries. Alternative C would road all seven of the areas; Alternatives NC, Q and E would road six of the areas; Alternative A, five of the areas; Alternative I, two; Alternative H, one; and finally Alternative F would not road any of the areas. As fewer of the unroaded areas adjacent to wilderness are roaded, the incidence of the effects described above would decrease accordingly.

Cumulative Effects

There are cumulative effects on Wilderness as a consequence of any of the proposed alternatives. One such effect is the designation or nondesignation of lands as Wilderness by Congress. Approximately 18% of the Forest is currently designated Wilderness. This has the effect of preserving a wide range of natural resources in their natural condition. In Wilderness, water, vegetation, soil and air quality will be maintained in a natural state. The non-designation of suitable lands may result in the development of such land and over time may become unsuitable for future Wilderness consideration. Another effect on Wilderness is the development, such as timber harvest and road construction, that may occur adjacent to Wilderness boundaries. This effect will result in physical changes, that over a period of time can influence the type or quality of experience opportunities to be provided in Wilderness and alter the microsite conditions along Wilderness boundaries. Typically, without some form of use limitation, improved access could result in a greater number of visitors entering the Wilderness at more locations, adversely affecting the type of user experience currently being provided or intended. In addition continued Wilderness use at current levels could result in the permanent loss of essential Wilderness character in some locations of individual Wildernesses. Those alternatives that reduce most of the roadless areas will increase the risk that the long-term quality of experience of some roadless areas may be reduced.

Mitigation

Wilderness settings will be managed in all alternatives through the application of standards and guidelines which apply to all management activities.

Mitigation measures consist of a broad range of actions that avoid, minimize, rectify, reduce, or compensate for environmental effects.

If recreation use exceeds capacities, or the levels of acceptable environmental change established for any specific WRS class within a Wilderness, specific actions will be taken to reduce unacceptable use levels. These actions may consist of a permit system, closure of specific areas within Wilderness, access restrictions, and closures of roads or trails leading to points of entry. In addition, and as a prerequisite to other actions, user education and public contact would be used to assist in the prevention of misuse and overuse of the Wilderness environment and related resource degradation. The establishment and monitoring of LAC (Limits of Acceptable Change) factors for various elements of the Wilderness resource will aid in reducing effects on the environment. The LAC (U.S. Department of Agriculture-Forest Service 1985) process gives primary attention to acceptable existing Wilderness conditions and prescribing actions to protect or achieve those conditions. If the conditions are exceeded, action is taken to bring them into an acceptable range.

In areas that are characterized by concentrated use, mitigation measures can ensure maximum use and enjoyment within wilderness management standards. Typical areas of high use are arterial trail corridors, areas where major trails intersect, converge, or lead to places of high interest or destination, and staging areas or trailheads; transition WRS zones typify this high use. In this WRS class, group sizes are larger; more groups will encounter each other; and, where they occur in this class, more campsites would be visible.

If existing standards and guides appear to be inadequate as use increases, additional mitigation measures can be taken. Methods to maintain the essential character of Wilderness, group sizes, encounters with other parties, and intervisibility of campsites can be limited. Campfire sites can be designated if resource damage indicates a need. Dispersal of camps from each other and from attractive features within the Wilderness can reduce effects of concentrated use. To manage high intensity use and resource degradation camping may be prohibited in specific areas to facilitate recovery of natural conditions. These and other measures may be found in the A2 Wilderness S & Gs included in the Forest Plan.

Although all prescribed burning in Oregon will be scheduled for times when winds are expected to disperse smoke concentrations, smoke and haze may be evident in the airshed over or adjacent to Wilderness. The Clean Air Act and its 1977 Amendments mandate air quality and visibility protection for the Mt. Hood and Mt. Jefferson Wildernesses. New Wildernesses established under the Oregon Wilderness Act of 1984, to date have not been redesignated visibility protected Class I Areas. Additional mitigation measures for reducing the impacts of prescribed burning on Wilderness air quality values include the scheduling of burning to avoid high Wilderness recreation use periods; increasing wood utilization on harvest units; and decreasing suspended particulate emissions production from slash burning (See also the discussion on Air in this Chapter).

During the past 40 to 50 years, fire suppression efforts have generally suppressed fires in the Wilderness at a smaller size than free-burning natural fires. Because of this change in the fire regime there has been some increase in forest residues, although the buildup has not generally reached a critical level in the western Cascades. Over time however, this may develop into a greater problem and larger, more intense wildfires could be expected in the future. The longer fire is kept out of these areas, the more the vegetation develops towards a climax seral stage with higher accumulations of natural dead and down material. Prescribed burning may be considered in Wilderness where necessary to perpetuate natural ecosystem succession without threatening public safety or adjacent nonwilderness lands. For additional information on prescribed burning and fire suppression in the Wilderness see Section 5, Fire.

Unroaded Areas

Introduction

The roadless areas inventoried for potential during the Roadless Area Reviews and Evaluations (RARE I and RARE II) are discussed in this component. Through a process more fully described in Appendix C, Roadless Areas, FEIS, eleven unroaded areas have been site-specifically analyzed. This analysis includes: a description of the physical and biological conditions of the area, the capability of the area for management as wilderness, other resource opportunities, need for undeveloped areas, and the environmental consequences associated with each Forest Plan Alternative.

The eleven remaining Roadless Areas are a result of the Roadless Area Review and Evaluation (both RARE I and II), two completed unit plans (Roaring River/Salmon River FEIS, 1/74; and Eagle Creek Planning Unit FEIS, 1/75), and the Oregon Wilderness Act of 1984. The passage of the Act eliminated the need for the remaining unroaded areas to be studied for Wilderness during the first generation of Forest Plans with the exception of the Olallie Further Planning Area. However, this Congressional direction does not preclude consideration of other Non-Wilderness unroaded areas for unroaded management in the Forest Plan.

The environmental consequences associated with a given alternative are dependent on the land allocations that would apply to a specific unroaded area if not managed by a prescription that maintains its unroaded character.

The following analysis compares the existing conditions associated with a particular unroaded area to an estimate of conditions that would exist under a specific alternative. Refer to Appendix C, Roadless Areas, FEIS, for complete information regarding specific allocations and proposed management not detailed in this analysis.

Significant Interactions

Environmental consequences result from management activities that modify the unroaded character of an area. The most significant activities are timber harvesting and accompanying road building. Differences in rate of harvest and design of timber sales and transportation networks must be considered. In addition, facilities for developed recreation (e.g., ski areas) may eliminate the unroaded character. Generally, management activities such as facilities for dispersed recreation and fish and wildlife habitat improvement projects may be designed and implemented while maintaining the unroaded character of the area. Other activities, such as mineral exploration and development, hydroelectric projects, and special uses (e.g. transmission lines), may result in significant environmental consequences. While their occurrence is unpredictable, there is a discussion of the existing and potential mineral and land use activities in Appendix C FEIS.

Related ICOs

- Disposition of remaining roadless areas.
- The ability to meet existing and future developed recreation demand

Direct and Indirect Effects

The information that follows describes the effects of its alternatives on the quality and quantity of the roadless environment. All references to the Lake Roadless Area only consider the 1350 acres located outside the Bull Run Watershed Management Unit. All Roadless Area acreages available for timber harvest will be entered in the first decade; therefore, entry rates and acreage remaining is the same for each decade. See Table IV-34 for a summary of acres remaining in each Roadless Area. Currently, there are approximately 118,350 acres remaining of the RARE II Roadless acres.

The rates of entry by decade show the relationship over time as to how much area will remain unroaded. This is illustrated in Table IV-34.

Alternative NC and A

Alternatives NC and A continue current management direction. Eighty-five percent or more of the following unroaded areas are allocated to a management prescription that harvests timber: Badger Creek, Bull of the Woods, Mt. Hood Additions, Salmon-Huckleberry, Twin Lakes, Lake and Wind Creek. Thus, these areas will be developed and no longer retain unroaded qualities. They will not, in the future, be available for Wilderness designation or unroaded area management.

The Roaring River Roadless areas will be managed under prescriptions that maintain unroaded qualities for approximately 71% of the area. The portions managed for timber are discrete areas proposed for entry in the first decade. Consequently, the majority of these areas would be available for future Wilderess designation and continued unroaded area management.

Greater than 90% of the Olallie, Larch, and Eagle unroaded areas are to be managed to retain their unroaded character. The discrete areas available for timber harvest will be entered in the first decade. The option of Wilderness designation would, therefore, be available in the future for the vast majority of these areas also.

Table IV-34 Acres of Roadless Areas Remaining Over Time*

Decade	Alternative							
	NC	A	C	E	F	H	I	Q (Preferred)
Decade 1	57,010	57,360	34,260	67,600	109,190	111,480	113,820	81,130
Decade 2	57,010	57,360	34,260	67,600	109,190	111,480	113,820	81,130
Decade 5	57,010	57,360	34,260	67,600	109,190	111,480	113,820	81,130

* *All roadless areas available for timber entry are entered in the first decade.*

Alternative C

Under Alternative C, 90% or more of the following Roadless Areas will be allocated to a management prescription that harvests timber: Badger Creek, Bull of the Woods, Lake, Mt. Hood Additions, Olallie, Salmon-Huckleberry, Twin Lakes, and Wind Creek. The Eagle and Larch areas will be managed under prescriptions that maintain the unroaded qualities over at least 90% of the area. (Only 18% of the Roaring River area will remain in an unroaded condition). These areas will no longer retain unroaded qualities, and therefore will not be available for future wilderness designation or unroaded area management. The specific areas available for timber harvest will be entered in the first decade. The option of wilderness designation would therefore, be available in the future for the vast majority of these areas.

Alternative E

Eighty-five percent or more of the following unroaded areas are allocated to a management prescription that harvests timber: Badger Creek, Bull of the Woods, Mt. Hood Additions, and Twin Lakes. These areas will no longer retain unroaded qualities. They will not in the future, be available for Wilderness designation or unroaded area management.

The Lake, Salmon-Huckleberry, and Wind Creek unroaded areas will be managed by prescriptions that maintain unroaded qualities for approximately 44%, 21%, and 60% of the areas, respectively. The portions allocated to timber emphasis are discrete areas proposed for entry in the first decade. These areas would not be available for potential Wilderness designation or continued unroaded area management in both alternatives.

Greater than 90% of Eagle, Larch, and Olallie unroaded areas are to be managed by prescriptions that retain their unroaded character. The option of Wilderness designation for these areas would be available in the future.

Alternative F

Between eighty and ninety percent of the following areas are allocated to management prescriptions that do not harvest timber and maintain the unroaded guidelines: Lake, Mt. Hood Additions, and Salmon-Huckleberry. More than 90% of the remaining roadless areas are allocated to prescriptions that do not harvest timber and subsequently, maintain the unroaded qualities. The small percentages of these areas that are available for harvest, would be entered in the first decade. In this alternative, the option of wilderness designation would be available for significant portions of all the Roadless Areas.

Alternatives H and I

These alternatives are very similar to Alternative F with the following exceptions: 21% and 40% of the Badger Creek area respectively is allocated to management prescriptions that harvest timber. Significant portions of these areas would therefore remain available for potential wilderness designation. In Alternative H, 85% of Mt. Hood Additions and 83% of the Salmon-Huckleberry areas will remain allocations that protect the unroaded qualities. Most of these areas would therefore be available for a future wilderness designation option.

At least 90% of all the following areas remain in allocations that maintain the unroaded characteristics and therefore future options for wilderness designation: Bull of the Woods, Eagle, Lake, Larch Mountain, Mt. Hood Additions (Alternative I only), Olallie, Roaring River, Salmon-Huckleberry (Alternative I only), Twin Lakes, and Wind Creek. The small, discreet areas available for timber harvest would be entered in the first decade.

Alternative Q

This alternative allocates 100%, 71%, 66%, and 76% of the Badger Creek, Bull of the Woods, Mt. Hood Additions, and Salmon-Huckleberry Roadless Areas respectively to management prescriptions that allow timber harvest. These areas would be entered in the first decade, and therefore not be available for future wilderness designation options.

Seventy-three percent of the Lake area, and 82% of the Roaring River and Wind Creek areas will remain in management prescriptions that do not harvest timber. Significant portions of these areas would, therefore be available for future wilderness designation options.

More than 90% of the following areas are to be managed under prescriptions that maintain their unroaded character: Eagle, Larch, Olallie, and Twin Lakes. These areas would therefore be available for wilderness designation options in the future.

Cumulative Effects

Cumulative effects of the alternatives on unroaded areas are twofold, based on the rate of timber harvest. The long-term effect of harvest is modification of the landscape and recreational experience within an unroaded area. These will be a loss of roaded natural, semi-primitive non-motorized, and primitive recreational experiences with allocation of an area to timber management. This will result in a change in the quality and type of recreation experience. This change is proportional to the area removed from roadless condition. Secondly, harvest will, over time, eliminate the potential to designate an unroaded area, or portion thereof, for legislative classification as Wilderness.

Mitigation

The Forest Plan describes the measures necessary to mitigate the effects of management activities on unroaded areas. The intent is to provide a primitive or semi-primitive recreational experience in an unmodified environment with no programmed timber harvesting allowed. In addition, facilities are to be maintained or developed only where needed to protect the resource.

The mitigation measures described for a particular unroaded area apply unless a more restrictive land allocation occurs. In this case, the area will be managed by the most restrictive allocation. Managing for a primitive recreational experience can effectively mitigate effects on unroaded areas.

Potential Conflicts with Plans and Policies of Other Jurisdictions

Please refer to the end of this chapter for a discussion of the possibility of conflicts between the alternatives and the plans and policies of other jurisdictions with responsibility or authority for this environmental component.

Special Interest Areas

Introduction

Special Interest Areas (SIAs) are places on the Forest which contain unusual scenic, historical, archeological, geological, botanical, zoological, paleontological, or other special characteristics. These areas are normally managed for recreation uses and kept in their natural condition as closely as possible. Due to the special values of these areas, they are classified under 36 CFR 294.1 to assure continuity in their special management direction.

Significant Interactions

Each SIA possesses its own unique qualities, management standards and guidelines for them must be flexible yet restrict activities and uses which could be harmful. Therefore, the effects of each alternative are described in terms of:

- Areas which would be classified and managed as SIAs.
- Potential SIAs not designated as such in a particular alternative but subject to land allocations that would foreclose future opportunities for classification as an SIA. This assumes that boundaries of proposed SIAs would stay the same.

Existing SIAs include Barlow Tollgate, Columbia Gorge Old Wagon Road, Little Crater Lake, Oneonta Gorge, and Olallie Lake. Since Olallie has been designated a Further Planning Area (for Wilderness), it is not always described as an SIA.

Potential SIAs include Barlow Road, Larch Mountain, Roaring River (including Mitchell Flats), Lost Lake, Bagby Hot Springs, Sugar Pine, Little Crater Lake Expansion, Squaw Meadows, Parkdale Lava Beds, Olallie Lake Expansion, Clackamas Lake, Cloud Cap-Tilly Jane, Mill Creek Buttes, Old Maids Flat, and Stringer Meadows.

Direct and Indirect Effects

Alternative NC and A

All existing SIAs would continue as such under Alternative A and Alternative NC. Under Unit Plans now in effect, Bagby Hot Springs, Face of the Columbia Gorge, Olallie Lake Expansion, Roaring River, Squaw Meadows, and Mill Creek Buttes would be proposed SIAs. All other areas which could potentially be designated SIAs would lose that potential because they would be managed for timber harvest, and this would cause major alterations in vegetation. Alteration of the areas' natural environment would foreclose future possibilities of designating them SIAs.

Alternative C

All existing SIAs except Olallie Lake would continue as such under Alternative C. All other areas which could be potentially designated SIAs would lose that potential because they would be developed for timber management.

Alternative F

All existing SIAs would continue as such under Alternative F. This alternative's SIAs would include Barlow Road, Bagby Hot Springs, Cloud Cap-Tilly Jane, Larch Mountain, Lost Lake, Roaring River, Sugar Pine, Squaw Meadows, Old Maids Flat, Clackamas Lake, Olallie, and Parkdale Lava Beds.

The Stringer Meadows proposed SIA would be managed to protect its ecological value under a Wild and Scenic River allocation. Since Stringer Meadows is the outstandingly remarkable value for which the East Fork

Table IV-35 Recommended Special Interest Areas by Alternatives

Special Interest Area	NC	A	C	E	F	H	I	Q (Preferred)
Cloud Cap-Tilly Jane	X	X	X	X	X	X	X	X
Barlow Tollgate	X	X	X	X	X	X	X	X
Columbia Gorge Old Wagon Road	X	X	X	X	X	X	X	X
Little Crater Lake	X	X	X	X	X	X	X	X
Little Crater Lake Expansion	X	X		X	X	X	X	X
Olallie Lake	X	X		X	X			X
Olallie Lake Expansion				X	X			X
Barlow Road				X	X	X	X	X
Larch Mountain				X	X	X	X	X
Roaring River				X	X	X	X	X
Lost Lake				X	X	X	X	X
Bagby Hot Springs				X	X	X	X	X
Sugar Pine				X	X	X	X	X
Squaw Meadows				X	X		X	X
Parkdale Lava Beds				X	X	X	X	X
Old Maids Flat					X	X	X	X
Clackamas Lake					X	X	X	X
Stringer Meadows						X		X
Mill Creek Buttes	X	X				X		
Oneonta Gorge	X	X	X	X	X	X	X	X

Wood River was found eligible then its values would be protected and therefore, its future potential for SIA designation would be protected (see FEIS Ch. IV Wild and Scenic Rivers for detailed description).

Mill Creek Buttes would be managed for timber production and watershed emphasis, and would therefore lose the potential for SIA designation due to the subsequent vegetation alteration.

Alternative E

All existing SIAs would continue as such under Alternative E. This alternatives' SIAs would include Bagby Hot Springs, Barlow Road, Larch Mountain, Little Crater Lake Expansion, Lost Lake, Olallie Lake Expansion, Parkdale Lava Beds, Roaring River, Squaw Meadows, and Sugar Pine. All other areas with the potential of being designated SIAs would lose that potential under these alternatives because they would be managed for timber production.

Alternative H

All existing SIAs except Olallie Lake would continue as such under Alternative H. Proposed SIAs include Bagby Hot Springs, Barlow Road, Cloud Cap-Tilly Jane, Larch Mountain, Roaring River, Lost Lake, Sugar Pine, Old Maids Flat, Clackamas Lake, Stringer Meadows, Mill Creek Buttes, and Parkdale Lava Beds. All other areas which could potentially be designated SIAs (Squaw Meadows, Olallie Lake and expansion) would retain that potential since they would be managed for dispersed unroaded recreation or old growth forest characteristics. No chargeable timber harvest or other major changes in vegetation would occur.

Alternative I

All existing SIAs except Olallie Lake would continue as such under Alternative I. Proposed SIAs include Bagby Hot Springs, Barlow Road, Clackamas Lake, Cloud Cap-Tilly Jane, Larch Mountain, Little Crater Lake Expansion, Lost Lake, Parkdale Lave Beds, Roaring River, Squaw Meadows, Sugar Pine, and Old Maids Flat. The back country unroaded area of Olallie Lake would be recommended for Wilderness under this alternative which would foreclose any future SIA designation, however the effects on the area would be similar.

The Mill Creek Buttes area would be managed for watershed emphasis and timber production, thereby eliminating future SIA consideration. The Stringer Meadows area would be managed under the Wild and Scenic River allocation. This allocation would protect the ecological values associated with Stringer Meadows, therefore protecting it for future SIA designation.

Alternative Q

All existing SIAs, including Olallie Lake, would continue as such under Alternative Q. Proposed SIAs include Cloud Cap-Tilly Jane, Barlow Road, Larch Mountain, Roaring River, Lost Lake, Bagby Hot Springs, Sugar Pine, Squaw Meadows, Parkdale Lava Beds, Old Maids Flat, Clackamas Lake, Stringer Meadows, Little Crater Lake Expansion, and Olallie Lake Expansion. The Mill Creek Buttes area would be managed for watershed emphasis and timber production thereby eliminating future SIA designation due to the subsequent vegetation alteration.

Cumulative Effects

No cumulative effects are known at this time.

Mitigation

If an area is not selected for SIA designation, vegetative and recreation visitor management techniques could be used to help mitigate any potential adverse impacts of nonselection. If the visual quality objective of retention were met in the undeveloped areas of a proposed but not selected-SIA, and the desired Recreation Opportunity Spectrum (ROS) class was maintained, then the environment would be essentially managed in its natural condition. The level of development allowed in areas already developed would influence the potential designation of a nonselected SIA in the future. In summary, if management of nonselected SIAs were to follow closely the standards and guidelines for SIAs, these could be considered as mitigation measures to help offset the potential negative impacts of nonselection in an area for SIA designation.

Potential Conflicts with Plans and Policies of Other Jurisdictions

Please refer to the end of this chapter for a discussion of the possibility of conflicts between the alternatives and the plans and policies of other jurisdictions with responsibility or authority for this environmental component.

Visual Resource

Introduction

In this section the visual condition of the Forest will be described as it is projected to appear under each alternative. Because most visitors to the Forest identify with its specific landscapes, effects of alternative activities will be reviewed for 46 of the most popular landscapes. The term "viewshed" is used to describe an area or landscape as it would be seen from a particular travel route or area used otherwise by Forest visitors. Each viewshed receives a summary rating that describes the general impression of the landscape on a visitor passing through the viewshed. Summary ratings have been determined by the amount and type of alteration to the landscape environment due to management activities. Ratings are expressed as "Natural Appearing," "Slightly Altered," " Moderately Altered," or "Heavily Altered." These four ratings are explained and illustrated in the next several pages.

Three basic assumptions, reflected in management direction, have been used to guide the estimating of the effects of management activities within viewsheds:

- The visual condition of the viewsheds in the future will be closely related to the amounts and types of timber harvest.
- A variety of timber harvest methods will be used in viewsheds. These include clearcut, shelterwood harvest and uneven age management systems.
- Timber harvest units in all areas will be shaped to blend with the natural characteristics of the landforms.

Criteria used in determining which viewshed condition best applies to a particular landscape include the alterations or modifications described by the terms below. All percentages of alterations specify the area within a viewshed which can be seen from a ground observer's position. Illustrations of the four typical viewshed conditions follow the verbal descriptions.

Natural Appearing:

- Less than 5% visually altered
- Less than 1% altered to the visual quality level of Modification

- 0% altered to the Maximum Modification or Unacceptable Modification levels.

Slightly Altered:

- Less than 10% visually altered
- Less than 5% altered to the level of Modification
- Less than 3% altered to the levels of Maximum Modification or Unacceptable Modification

Moderately Altered:

- Less than 20% visually altered
- Less than 10% altered to the level of Modification
- Less than 5% altered to the levels of Maximum Modification or Unacceptable Modification

Heavily Altered:

- More than 20% visually altered at any one time

Indirect effects on the visual environment can also occur. Some of those expected include the following:

Vegetation

Timber stands managed for visual objectives should have longer rotation ages than normal, and this would produce larger trunk diameters. In the foreground of viewshed management areas, that is, from zero to 1/4 mile away from the observer, dominant trees would grow to an average size of 32 inches before being harvested on a 250 year rotation. In the middleground, 1/4 mile to 4 miles, stands would be harvested on a 125 year rotation, equivalent to a proxy for a limit on the percentage of area to be visually disturbed at one time. These harvest limitations reduce the maximum timber output of the land in order to gain aesthetic benefits.

Water Quality

Scenic viewsheds and riparian areas are compatible. Both require reductions in disturbances which reduce the risk of degrading the quality of water. However, where vegetation management is used to retain or partially retain the landscape character, the impacts on water quality would be similar to those in normal timber management although predictably less severe. The lesser effects are due to reductions in the area harvested per decade in scenic viewsheds.

Effects on Soils

The effects on soils are approximately the same as the effects on water quality.

Effects on Fish

The effects on fish are approximately the same as the effects on water quality.

Effects on Wildlife

Managing for visual quality objectives would increase the amount of habitat available for wildlife species that depend on mature stands, as compared to areas where the timber is harvested at an earlier age under normal procedures. This result would be due to extended rotations, larger tree sizes, and constraints on the amount of an area disturbed at any one time.

Effects on Recreation

Viewing attractive forest scenery is classified as a recreational activity, and it is one of the higher recorded uses of the Forest. Managing the important viewsheds for visual resource values would enhance the recreational experiences of visitors in viewshed areas.

The cumulative effects of activities on visual resources under the various alternatives are closely tied to the rate of timber harvest in the sensitive viewsheds. In viewsheds not shown on the alternative maps as Management Area B2 (Scenic Viewshed), and scheduled for timber harvest, the long term cumulative effects would be a change from a landscape with a natural appearance to one with an altered appearance.

The rate of harvest which would retain or partially retain the natural character of the landscape was tested by computer modeling in 1981. (For more information, see Siskiyou National Forest, Scheduling Timber Harvest to Meet Visual Quality Objectives, 1981.) This study considered slope, logging systems, harvest schedules, and regrowth of new trees to find the percentage of a viewshed which could be "disturbed" at one time and still meet the visual quality objectives. While those results would require adjustment for differing conditions on similar forests, harvesting even at normal rates does not generally allow enough time for the regrowth to maintain the typical forest vegetative character. Such harvests therefore have cumulative impacts on scenery.

On private lands adjoining the Forest, timber harvest has occurred and is expected to continue. Private land owners are not expected to change their land management activities to maintain or enhance visual quality; therefore, there will be cumulative impacts on Forest viewsheds where the private lands are seen from resorts, communities, and primary travel routes like Highway 26, Highway 35, and Lolo Pass Road.

Related ICOs

- Maintenance and enhancement of scenic quality
- Wild, scenic, recreational rivers
- Scenic quality
- Maintain quality of existing scenery and rehabilitate degraded views

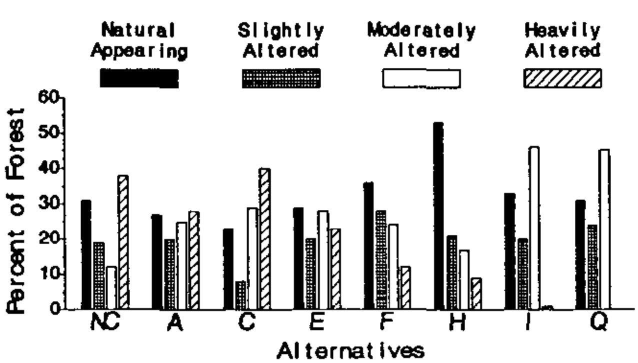
Significant Interactions

Three management activities have the greatest impacts on forest scenery. They are timber harvest, road construction, and utility corridors. Timber harvest can severely impact visual quality because the removal of trees visually creates strong contrasts of form, line, color, and texture when compared to natural landscapes. These impacts are of most concern when seen from primary and secondary travel routes and visitor destinations. Viewsheds seen from such areas are classified as sensitivity levels one and two.

Roads create a dominating visual contrast on the steep slopes which are common on the Forest. Cuts and fills accentuate the contrasts. Utility corridors are long, wide, and usually straight clearings with high contrast to natural landscapes. Corridors on the Forest are few and will not change by alternative, but their impacts are severe and last a long time.

Figure IV-35 graphically presents the expected visual condition of the Forest's viewsheds in the four levels of visual quality by alternative.

Figure IV-35 Expected Visual Condition of The Forest In Fifty Years



Environmental Effects of the Alternatives

Alternative NC (No Change)

Direct and Indirect Effects

Six of the 46 most important viewsheds would be managed in a natural appearing condition. These six viewsheds total 73,200 acres or 7% of the total Forest, and include Columbia Gorge, Bull Run Lake, Elk Lake, Olallie Lakes, and Roaring River (including South Fork). Highway 35, along with Still Creek, Larch Mountain, Timberline Road, Mt. Hood Meadows, and Skyline Road (North) would be managed in a slightly altered condition similar to the present appearance of these viewsheds. The total of Natural Appearing and Slightly Altered viewsheds would equal 11% of the entire Forest. This does not include the 17% of the Forest in Wilderness, which is constant in all alternatives.

All remaining viewsheds in sensitivity level one would become either moderately altered (19%) or heavily altered (10%). Timber harvesting and road construction would be the main source of alteration, with the most severe impacts to visual quality seen on the steep slopes. Measures to mitigate these impacts could include shaping and blending of cutting units to follow natural forms and contours of the land, and designing rights-of-way which blend into the landscape.

Cumulative Effects

Alternatives NC would have moderate to high cumulative effects resulting in 27-30% of the Forest maintaining a Natural Appearing or a Slightly Altered condition by the fifth decade.

Alternative A

Direct and Indirect Effects

Seven of the 46 most important viewsheds would be managed in a natural appearing condition. These viewsheds total 77,600 acres or 7% of the total Forest and include Columbia Gorge, Timberline, Olallie Lakes, Roaring River (including South Fork), Bull Run Lake, and Elk Lake. Highway 35, would be managed in a slightly altered condition similar to the present appearance. Four more Level I Viewsheds, Larch Mountain, Mt. Hood Meadows, Still Creek, and Skyline Road (North) would also be managed in a slightly altered condition. The total of Natural Appearing and Slightly Altered Viewsheds would equal 10% of the entire Forest. This does not include the 17% of the Forest in Wilderness which is constant in all alternatives.

All remaining viewsheds in sensitivity level one would become either moderately altered (14%) or heavily altered (16%). Timber harvesting and road construction would be the main source of alteration, and where these activities would take place on steep slopes the impacts to visual appearances would be severe. Measures to mitigate these impacts could include shaping and blending of harvest units to follow natural forms and contours of the land and designing rights-of-way which blend into the landscape.

Cumulative Effects

Alternatives A would have moderate to high cumulative effects resulting in 27-30% of the Forest maintaining a Natural Appearing or a Slightly Altered condition by the fifth decade.

Alternative C

Direct and Indirect Effects

Only two Level 1 viewsheds, totalling 3% of the Forest, would be managed in a Natural Appearing or Slightly Altered condition. This is the lowest level of visual quality provided by any alternative under consideration. Timber harvest would visually impact virtually the entire Forest, including major and minor travel routes, with the exceptions of the 17% Wilderness, Research Natural Areas, Wild and Scenic Rivers, the Columbia River Gorge National Scenic Area, and Mt. Hood Meadows. In short, 68% of the Forest would become moderately or heavily altered.

Cumulative Effects

Alternative C would have the greatest long term cumulative effects on scenery. Only 13% of the Forest outside of Wilderness would be managed in a Natural Appearing or Slightly Altered condition.

Alternative F

Direct and Indirect Effects

Under this alternative, 15 of the 46 Level 1 viewsheds equalling 12% of the Forest, would be managed in a Natural Appearing condition. Another 25 of the 46 Level 1 viewsheds would be managed in a Slightly Altered condition. Altogether 63% of the Forest would be managed in Natural Appearing or Slightly Altered conditions, including the 18% in Wilderness.

Only four Level 1 viewsheds, Upper Clackamas (South), Hot Springs Fork, Rhododendron Ridge, and Whetstone Creek would be Moderately Altered. Two viewsheds would be Heavily Altered over the long term even though there are now 14 viewsheds in that condition. This alternative would permit all 12 to recover to more natural vegetation through natural growth or rehabilitation actions.

Cumulative Effects

Alternative F would have relatively minor cumulative effects on the important viewing areas, with 45% of the Forest in a Natural Appearing or Slightly Altered condition.

Alternative E

Direct and Indirect Effects

Eight of 46 Level 1 viewsheds would be managed for a Natural Appearing condition. This would amount to 7% of the Forest. An additional 13 of the 46 Level 1 viewsheds would be managed for a Slightly Altered condition.

Altogether, this alternative would maintain 48% of the Forest in a Natural Appearing or Slightly Altered condition. Natural Appearing areas include Columbia Gorge, Timberline Road, Tom, Dick & Harry, Parkdale Lava Beds, Olallie Lakes, Roaring River, and Bagby Hot Springs plus all Wilderness. Slightly Altered areas include Highway 26 West, Highway 35, Larch Mountain, Trillium Lake, Timothy Lake, Barlow Road, and Lower Clackamas River. This would represent little change from the present visual conditions under current management prescriptions for these areas.

Twelve of the 46 Level 1 viewsheds equalling 13% of the total Forest would become Moderately Altered. Areas would include Tilly Jane, Dufur Mill Road, Still Creek, Highway 26 East, Salmon River Road, Oak Grove Fork, Barlow Creek, Olallie Creek, Lolo Pass, and Upper Salmon River.

Timber harvest would change the remaining 13 Level 1 viewsheds into a Heavily Altered condition. These areas, totalling 7% of the Forest, would include Skyline Road (N), Alder Creek, Rock Creek Res., Hot Springs Fork, Elk Lake, Rhododendron Ridge, and the view from Timberline Lodge.

Cumulative Effects

Alternative E would have low to moderate cumulative effects on scenery. While providing 30-34% of the Forest in Natural Appearing or Slightly Altered conditions, this alternative would also harvest timber in 19-25 of the highest sensitivity viewsheds at an accelerated rate.

17% of the Forest designated as Wilderness would remain in an undisturbed visual condition.

Alternative H

Direct and Indirect Effects

For a maximum level of visual quality, 21 of the 46 Level 1 viewsheds would be managed for a Natural Appearing condition. These areas total 14% of the Forest. Another 21 of the 46 viewsheds would be managed for a Slightly Altered condition. Altogether, 73% of the Forest would be managed for a Natural Appearing or Slightly Altered condition, including the 18% Wilderness.

Only 4 Level 1 viewsheds would be Moderately Altered, or 4% of the Forest.

No Level 1 viewsheds would become Heavily Altered.

Cumulative Effects

Alternative H would have the least cumulative effects on the scenery. Nearly all of the viewsheds rated high in sensitivity (36% of the Forest) would be either Natural Appearing or Slightly Altered.

Alternative I

Direct and Indirect Effects

This alternative would manage 10 of the 46 Level 1 viewsheds in a Natural Appearing condition. This would represent 7% of the entire Forest.

Seventeen Level 1 viewsheds would be managed in a Slightly Altered condition. This would total an additional 14% of the Forest. Eleven viewsheds would become Moderately Altered (14%), and eight would be Heavily Altered. These include Hot Springs Fork, Upper Pansy Creek, Dickey Creek, Rhododendron Ridge, Bull of the Woods background, Whetstone Creek, Rhododendron Meadow, and Oak Grove Fork.

Cumulative Effects

Alternative I would have low to moderate cumulative effects on scenery. While providing 30-34% of the Forest in Natural Appearing or Slightly Altered conditions, this alternative would also harvest timber in 19-25 of the highest sensitivity viewsheds at an accelerated rate.

17% of the Forest designated as Wilderness would remain in an undisturbed visual condition.

Alternative Q

Direct and Indirect Effects

The proposed plan designates 20 of the 46 Level 1 as B-2 Scenic Viewshed management areas. In addition, 16 of the 46 Level 1 viewsheds not designated as B-2 areas are allocated to management areas which will produce scenic qualities similar to the designated viewsheds. Twelve of the Level 1 viewsheds will be managed in a natural appearing condition and 22 will become slightly altered over time. Another 12 of the Level 1 viewsheds will be moderately altered, but none of them will be heavily altered.

The total of all natural appearing and slightly altered landscapes, including the Wilderness, will be 55% of the Forest. The remaining 45% will become moderately altered over time. This includes some land which are now below that level, but are expected to improve in scenic quality due to regrowth. The individual viewsheds and their predicted future visual conditions are shown in Table IV-36.

Cumulative Effects

Alternative Q would have low cumulative effects on scenery resulting in 36% of the Forest in Natural Appearing or Slightly Altered conditions by the fifth decade.

Table IV-36, Visual Condition of Viewsheds, shows the present and future conditions after 50 years. Figure IV-35, Expected Visual Condition of the Forest, illustrates the ratings pictorially.

Mitigation

Measures available to reduce the impact of various land management activities have been fully described in several Visual Resource Management Handbooks published by the USDA Forest Service, and located in National, Regional, Supervisor, and District offices. These handbooks are specific regarding mitigation of individual land uses, such as timber management, roads, range management, utilities, ski areas, and others.

The Forest Plan contains Forestwide and Management Area standards which establish visual quality objectives for the various Management Areas. The Plan also provides resource-specific guidance on how to achieve Forest management objectives. In effect, the principles of design will be used to integrate all of the various land management activities with the character of the natural landscape. The intensity of this effort is intended to strike a balance between other uses of the land, the costs of mitigation, and the relative importance of the visual resource in each particular area.

Table IV-36 Visual Condition of Viewsheds

Code #	Viewshed Name	Acres	Existing Visual Condi-tion	Expected Future Visual Conditions							
				Alternative							
				NC	A	C	E	F	H	I	Q (Preferred)
01	Col. Gorge	31,900	NA	NA	NA	NA	NA	NA	NA	NA	NA
02	Larch Mt.	8,640	SA	SA	SA	MA	SA	NA	NA	SA	NA
04	Lost Lake	5,710	MA	MA	MA	MA	HA	SA	SA	SA	SA
05	Bull Run Lk.	6,650	MA	NA	NA	HA	SA	SA	SA	SA	SA
06	Upper Hood R.	11,520	SA	MA	HA	HA	MA	SA	SA	MA	SA
07	Hwy 26 West	24,820	SA	MA	MA	HA	SA	SA	NA	SA	SA
08	Lolo Pass	9,765	HA	MA	MA	MA	MA	SA	SA	MA	MA
09	Tilly Jane	1,374	SA	MA	MA	MA	MA	NA	NA	NA	SA
10A	Hwy 35 North	16,830	SA	SA	SA	HA	SA	SA	NA	SA	SA
10B	Hwy 35 South	9,277	SA	MA	MA	MA	SA	SA	NA	SA	SA
11A	Timberline Rd.	4,386	NA	SA	NA	MA	NA	NA	NA	SA	NA
11B	Timberline Lodge	15,895	MA	MA	HA	HA	HA	SA	SA	SA	SA
12	Mt. Hood Meadows	2,582	SA	SA	SA	SA	SA	SA	SA	SA	SA
13	Barlow Creek	10,017	SA	MA	MA	MA	MA	SA	SA	SA	SA
14	Dufur Mill Rd.	22,300	MA	MA	HA	HA	MA	SA	SA	MA	SA
18	Tom, Dick & Harry Mountain	1,793	NA	HA	MA	HA	NA	NA	NA	NA	NA
19	Still Creek	4,257	NA	SA	SA	HA	MA	NA	NA	NA	MA
20	Trillium Lake	826	MA	MA	MA	HA	SA	SA	SA	SA	SA
21	Hwy 26 East	20,157	SA	MA	MA	HA	MA	SA	SA	MA	MA
22	Salmon River Road	917	SA	MA	MA	MA	MA	NA	NA	SA	NA
24	Upper Salmon	1,370	SA	MA	MA	MA	MA	SA	SA	NA	SA
26	Parkdale Lava Bed	1,135	SA	MA	MA	HA	NA	NA	NA	SA	NA
27	Alder Creek	2,395	MA	HA	HA	HA	HA	SA	NA	MA	MA
31	Skyline Road North	1,672	SA	SA	SA	HA	HA	SA	SA	SA	SA
32	Hwy 216	1,500	SA	MA	HA	HA	SA	SA	SA	SA	SA
33	Timothy Lake	16,125	MA	MA	MA	HA	SA	SA	SA	SA	SA
34	Rock Creek Reservoir	2,400	MA	MA	HA	HA	HA	SA	SA	MA	SA

Table IV-36 Visual Condition of Viewsheds (continued)

Code #	Viewshed Name	Acres	Existing Visual Condition	Expected Future Visual Conditions Alternative							
				NC	A	C	E	F	H	I	Q (Preferred)
35	Barlow Road	3,670	NA	MA	MA	HA	SA	NA	SA	SA	SA
36	Lower Clackamas River	30,900	MA	MA	MA	MA	SA	NA	SA	MA	SA
37A	Upper Clackamas North	29,140	HA	HA	HA	HA	MA	SA	SA	MA	SA
37B	Upper Clackamas South	10,435	HA	HA	HA	HA	SA	MA	MA	MA	MA
38	Hot Springs Fk.	18,543	HA	HA	HA	HA	HA	MA	MA	HA	SA
39	Upper Pansy Cr.	1,444	HA	HA	HA	HA	HA	HA	NA	HA	MA
40	Dickey Creek	335	HA	HA	HA	HA	HA	HA	NA	HA	MA
41	Elk Lake	1,144	MA	NA	NA	HA	HA	NA	NA	NA	NA
42	Rhodo Ridge	3,458	HA	HA	HA	HA	HA	MA	NA	HA	MA
43	Bull O'The Woods	8,745	HA	HA	HA	HA	HA	SA	SA	HA	MA
44	Berry Creek	1,162	HA	HA	HA	HA	HA	SA	SA	MA	SA
45	Olallie Lake	10,752	NA	NA	NA	HA	NA	NA	NA	NA	NA
46	Olallie Creek	7,926	HA	MA	MA		MA	SA	MA	MA	MA
47	South Fork Roaring R.	5,327	NA	NA	NA	HA	NA	NA	NA	NA	NA
48	Roaring R.	17,438	NA	NA	NA	MA	NA	NA	NA	NA	NA
49	Whetstone Creek	1,610	HA	HA	HA	HA	HA	MA	NA	HA	MA
50	Rhodo Meadow	6,893	HA	HA	HA	HA	HA	SA	MA	HA	MA
51	Oak Grove Fork	15,149	MA	HA	HA	HA	MA	SA	SA	HA	SA
53	Bagby Hot Spring	1,362	SA	MA	MA	MA	NA	NA	NA	NA	NA

Key: N.A.- Natural Appearing; S.A.- Slightly Altered; M.A.- Moderately Altered; H.A.- Heavily Altered

Examples of the application of the principles of visual resource management since 1970 can be observed in the Highway 26 and Timothy Lake viewsheds. The effectiveness of these types of mitigation measures for visual resources is quite high clearly. It is evident in these viewsheds, where timber management is practiced with relatively minor impacts on visual quality.

Potential Conflicts with Plans and Policies of Other Jurisdictions

Please refer to the end of this chapter for a discussion of the possibility of conflicts between the alternatives and the plans and policies of other jurisdictions with responsibility or authority for this environmental component.

Cultural Resources

Introduction

The National Historic Preservation Act, Executive Order 11593, and other laws, regulations, and policies dictate a process of inventory, evaluation, preservation and protection of cultural values that may be affected by management activities. Each alternative will employ these laws and regulations through application of the standards/guidelines (see Chapter Four of the Forest Plan). Under each alternative all ground disturbing project areas will be inventoried and cultural sites located will be recorded. The sites will be evaluated for their eligibility to the National Register of Historic Places, and harmful effects will be avoided or mitigated.

Each alternative will have varying levels of timber harvest (see Table II-13 of the Forest Plan) and dispersed recreation (See Table II-19). Other activities also affect cultural resources, but these two have the greatest effect and are a good measure of the potential to affect sites on the Forest. Therefore, for the purpose of estimating effects on cultural resources, the Alternatives are considered according to the number of acres in scheduled timber harvest and planned increase in dispersed recreation.

The primary effect on cultural resources is change in the size and condition of the cultural resource data base. Measuring changes to cultural resources is dependent upon our ability to locate them and to observe their physical characteristics before, during and after management activities and visitor use. Effects are often negative. Cultural sites and values are destroyed by heavy equipment; lost through illegal theft and vandalism; and damaged, compacted or dislocated from visitor trampling. Examples include destruction or displacement of surface remains such as prehistoric hearth rings or the ruins of historic log cabins. Stone tools or glass bottles can easily be displaced or taken. Effects can also be positive in that the inventories result in an increased data base with opportunities for research and public interpretation. Thus, alternatives calling for greater timber harvest and road construction and those resulting in additional recreation use will increase the opportunities for locating cultural sites. These kinds of alternatives will also increase the potential for sites to be damaged or lost through management activities.

Cultural resources, like many of the natural resources, do not respect present-day land ownership boundaries. One can only gain an accurate picture of past activities and cultures from material remains by studying those remains in a broad context, one that crosses all ownership boundaries. Significant sites also occur on land owned by private individuals, the State Parks Department, private timber companies and the counties. It is possible that projects undertaken by these individuals or agencies could disturb or destroy sites with information important to the understanding of this area's history. In cases where other agencies or private landowners are entering into agreements with the Forest Service such as land exchanges, cost-share projects, or road rights-of-way, the cooperator must comply with federal laws governing cultural resources.

The Confederated Tribes of the Warm Springs Indians have traditional use areas on the Forest. Tribal members understandably have a great concern for how Forest Service management activities could affect these lands. This is particularly important in relation to human burials. Under every alternative, the cultural resource program would include coordination and cooperation with local American Indian tribes.

Significant Interactions

Natural phenomena as well as human activities affect the condition of cultural resource sites on and under the Forest floor. Frost heaving, bioturbation (disturbance by roots and windthrows), snow melt, and wind and water erosion all affect cultural sites and their artifacts, features and structures. Activities like road construction, logging, and recreation site construction directly affect cultural resources. An indirect effect of these activities is to improve visitor access to the forest, thereby increasing the opportunity for site exposure, vandalism and theft. Thus, the condition of cultural resources is a result of natural forces, management activities, and the interaction of the two.

Timber management and recreational development most significantly affect cultural resources. Timber management (harvest, silviculture treatments, sale road construction) affects large expanses of land, increasing the potential for disturbing cultural resource sites. Recreation development does not affect as much land, but there is a close correlation between developed recreation site locations and significant archeological sites. These activities have the potential to disturb or destroy a cultural resource site through direct ground disturbance by heavy equipment or by increasing access into areas, creating the threat of illegal excavation and theft.

The same ground-disturbing activities that could destroy a site also provide the opportunity for discovery. Most cultural resource sites known to date were located during the course of compliance inventories for management activities. Increasingly, sites located during these inventories are evaluated, and the effects caused by management activities are mitigated through data recovery such as scientific excavation. Evaluation and scientific excavation increase our understanding of the human past, or cultural history. However, adverse project impacts and the required mitigation through data recovery excavation can also cause the ultimate loss of the site from the cultural resource data base. A point to remember is that cultural resources are nonrenewable. Once removed, they can never be replaced.

In summary, the significant interactions affecting cultural resources are a combination of natural agents and human activities. The primary management activities are timber harvest, road construction and recreation uses. Environmental effects on cultural resources are direct (management activities, soil erosion) or indirect (changes in access as a result of management activities). They can be beneficial (cultural resource study and interpretation opportunities) and negative (loss of nonrenewable sites and information). Management activities that open up an area to vandalism also open it up to potential enhancement and/or the interpretation of historic sites. This is especially true in recreation developments.

In summary, effects of the Alternatives on cultural resources are both direct (forest management activities) and indirect (access), and effects are both positive and negative. Management activities can damage sites directly, but provide the vehicle for discovery. Increased access can allow more theft and illegal excavation, but also increase opportunities for interpretation.

Other ground-disturbing activities that can affect cultural materials include (but are not limited to) spring development, wildlife habitat improvements, livestock grazing, wildfires, controlled burning, planting, fire suppression and trail construction.

Locations of natural springs may coincide with cultural resource sites. Development of the springs invites increased use and potential impacts from soil compaction, artifact breakage of cultural materials on or near the surface.

Wildfires and controlled burns can damage or destroy any above-the ground historic structures. Fire can also fracture stone artifacts laying on the ground. Suppression activities pose a threat to the resource especially when heavy equipment and shovels are used. This discussion of cultural resources assumes that projects would always enter new areas rather than re-enter places previously inventoried. Areas such as Wilderness, Special Interest Areas, Research Natural Areas, and unroaded areas would remain largely uninventoried for cultural resources until lands involved with more active management activities have been inventoried. Until data are gathered from these areas, which often have radically different environments from the rest of the Forest, our knowledge of the cultural resource data base will remain incomplete and possibly biased.

None of the alternatives would deny Native Americans access to areas of traditional or religious significance. However, various alternatives would affect the difficulty of access. The amounts of land allocated to various management strategies would influence the potential availability and supply of traditional or religious resources.

Related ICOs

- Diminishing supply, or availability, of resources traditionally used in Native American religious and cultural life.
- Protection of cultural resource values of National Register properties.
- Develop more interpretive sites, particularly historic sites.

Overview - Environmental Effects and Mitigation

Preservation laws, regulations, and policies dictate a process of inventory, evaluation, preservation and protection of cultural values that may be affected by management activities. Each alternative will employ these laws and regulations through application of the standards/guidelines. Under each alternative all ground disturbing project areas will be inventoried, all sites located will be recorded, the sites will be evaluated for their eligibility to the National Register of Historic Places, and harmful effects will be avoided or mitigated.

Each alternative will have varying levels of timber harvest (see Table II-13 of the Forest Plan) and dispersed recreation (See Table II-19). Other activities also affect cultural resources, but these two have the greatest effect and are a good measure of the potential to affect sites on the Forest. Therefore, for the purpose of estimating effects on cultural resources, the Alternatives have been grouped according to the number of acres in scheduled timber harvest and planned increase in dispersed recreation.

Cultural resources will be protected in all alternatives through the application of the standards and guidelines that apply to all management activities with the potential to disturb sites. The standards and guidelines implement the National Historic Preservation Act and Executive Order 11593 and insure that all ground-disturbing activities will be preceded by a survey for cultural resources, evaluation of sites located and mitigation of effects of management activities on any significant cultural resource.

Effects that vary among alternatives

Because laws govern all planned management activities, the only variable for cultural resource management is the potential to locate sites. That potential presents the possibility of the negative effects (disturbance or destruction through use of heavy equipment and theft or illegal excavation due to increased access), and positive effects (increase in the data base and opportunities for interpretation). Alternatives calling for greater harvest and road construction levels and more dispersed recreation will increase both the potential for locating sites and for inadvertently disturbing sites during management activities.

Timber Harvest

Based on the estimated harvest volumes in the first three decades, Alternatives A, NC, C and E have the greatest potential to affect cultural resources. The higher timber volumes in these alternatives require survey of more acres for cultural resources. This increases the potential for the discovery of new sites and for evaluation and interpretation. However, high volume also implies more harvest activity and sale road development, increasing the potential for disturbance to cultural resources above and below the ground surface. Increased access resulting from road construction can result in damage to historic and archeological sites by looters or curious visitors.

Alternative F, H and I display the lowest volumes. Lower harvest levels will result in fewer acres being surveyed for cultural resources and fewer chances for discovery of new sites and the corresponding evaluation and interpretive opportunities. Lower harvest levels would result in fewer roads into sensitive areas and less chance for disturbance or destruction of significant sites.

Recreation

Construction and management of developed recreation sites do not vary significantly by alternative. However, increased recreation use, especially dispersed recreation, can affect cultural resources. Alternatives F, H and I increase opportunities for dispersed use. These alternatives will likely result in an increase in cultural resource impacts from dispersed site and access improvements, relic collecting and repeated use of popular areas.

Direct and Indirect Effects of the Alternatives on Cultural Resources

Alternative NC

This alternative has the largest timber harvest per year. Potentially the greatest number of recorded cultural resources would be at risk by project impacts and required mitigation. The potential for unintended damage without mitigation would increase. Mitigation would recover important scientific data previously unavailable. Resource conflicts would increase at a faster rate than presently experienced. Very few sites would be interpreted for public enjoyment and enlightenment. The availability of traditional Native American resources would continue to diminish. Coordination with local Indian Tribes would remain at the current level.

Alternative A

There would be a large number of cultural resources potentially affected by project impacts and required mitigation after the first decade of management under this alternative. Potentials for inadvertent damage without mitigation would increase. Mitigation would recover important scientific data previously unavailable. The rate of resource conflicts would increase over time. Very few sites would be interpreted for public enjoyment. The availability of traditional Native American resources would continue to diminish. Coordination with local Indian Tribes would remain at the current level.

Alternative C

There would potentially be an increased number of recorded cultural resources at risk by project impacts and required mitigation. The potential for unintended damage without mitigation would increase. Mitigation would recover important scientific data previously unavailable. Resource conflicts would increase at a much faster rate than presently experienced. The opportunity for increasing the availability of traditional Indian resources would be greater than under any other alternative. A systematic method of coordinating within local Indian Tribes would be needed.

Alternative E

There would be a slightly increased potential for recorded cultural resources to be at risk by project impacts and required mitigation. The potential for accidental damage without mitigation would increase. Mitigation would recover important scientific data previously unavailable. Resource conflicts would decrease slightly from the present rate. Several significant sites would probably be interpreted to increase public awareness of the national heritage. Opportunities for increasing the availability of traditional Indian resources would be recognized. Coordination with local Indian Tribes on managing these resources would be needed.

Alternative Q

The potential for cultural resources to be at risk by projects impacts and required mitigation would be somewhat less than at the present level. The potential for unintended damage without mitigation would remain about the same level it is presently. Mitigation would recover important scientific data previously unavailable. Resource conflicts would decrease slightly from the present rate. Several significant sites would probably be interpreted to increase public awareness of the national heritage. Opportunities for increasing the availability of traditional Indian resources would be recognized. Coordination with local Indian Tribes on managing these resources would be needed.

Alternative F

There would be a notable decrease in the potential number of the recorded cultural resources that would be affected by project impacts and mitigation. The potential for unintended damage without mitigation would decrease. Mitigation would recover important scientific data previously unavailable. Resource conflicts would greatly decrease from the present rate. A number of significant sites would probably be interpreted for public enjoyment. The availability of traditional Indian resources would tend to diminish from current supplies. Some Coordination with local Indian Tribes on managing such resources would be needed.

Alternative H

After the first decade of management under this alternative, few of the recorded cultural resources would be affected by project impacts and required mitigation. However, the potential for unintended damage without mitigation would still increase, though to a lesser extent than in the more commodity-oriented alternatives. Mitigation would recover important scientific data previously unavailable. Resource conflicts would increase at an extremely slow rate. Few sites would be interpreted for public enjoyment and enlightenment. The availability of traditional Indian resources would tend to diminish from the current supply. Coordination with local Indian Tribes on managing such resources would be needed.

Alternative I

After the first decade of management under Alternative I, few of the recorded cultural resources would be affected by project impacts and mitigation. The potential for unintended damage without mitigation would still increase. Mitigation would recover important scientific data previously unavailable. Resource conflicts would decrease greatly from the present rate. A number of significant cultural resources would be interpreted for public enjoyment and enlightenment. The availability of traditional or religious Indian resources would tend to diminish from current supplies. Some Coordination with local Indian tribes on managing such resources would be needed

Cumulative Effects

The cultural resources on the Mount Hood National Forest are part of a much larger cultural environment comprised of the Columbia River Basin, the Columbia Plateau and the Cascade Range. Activities over time on these lands have disturbed or destroyed cultural remains, both prehistoric and historic. Hydro-electric developments on the rivers, illegal collection of artifacts, mineral exploration, gas transmission lines, among many other development activities have seriously depleted the cultural resource data base. The cumulative effects of these actions over time result in irretrievable loss of a large body of information. This loss raises the value of what remains, and much of what remains is on National Forest land. The Forest has a unique opportunity to manage the remaining resources with sensitivity and forethought; to save or study the sites before they are destroyed.

As major projects such as timber sales continue through the years, the available land base in which to relocate those projects to avoid a cultural resource site, will continue to decline. This will produce a growing number of potential impacts to cultural resources. Such direct impacts would have to be mitigated by data recovery or documenting the site to specific standards. This could recover some or most of the data the site contains. Alternatively it would provide a paper record of its characteristics. Neither would prevent the loss of the site for future study or public enjoyment. There is no adequate compensation for the loss of some sites. Some are aesthetically and emotionally significant, and they convey a special link with the past for both Native American and other communities. For some sites with national values, such as Timberline Lodge or the Barlow Road, their loss would reduce America's national heritage.

Cultural resource values may undergo cumulative reduction by the lack of maintenance, through natural weathering, deterioration, erosion, or vandalism through lack of adequate security. Historic buildings can be kept in good condition as long as the users continue to maintain the structures. If, however, maintenance isn't undertaken with sensitivity to the historic characteristics of the buildings, the cultural values lost would be the same as though the building were lost for other reasons.

Cultural values have already been lost for some traditional or religious Indian resources such as huckleberries. This reduction has taken place since the early 1900s when many of the more productive huckleberry fields were maintained by forest fires. Modern fire suppression has resulted in new tree growth that shades the huckleberries and reduces productivity. If enhancement measures are not undertaken to restore or increase huckleberry production, supplies will continue to decline. They may not be lost entirely, however, since huckleberries survive as an understory vegetation in many of the Forest's higher elevations.

Mitigation

Effects to cultural resources discussed so far are those resulting from management activities. Illegal collection and excavation also affect cultural resources, and the Forest has less control over those activities, certain mitigation measures can lessen their impacts. The following discussion will include mitigation measures for management activities and for illegal activities.

Mitigation measures for cultural resources minimize effects of management activities on the cultural sites and their environmental setting. A number of possible measures exist which protect all or a portion of the site in place or extract the information from the site before it is destroyed. Each requires consultation with the State Historic Preservation Office and the Advisory Council on Historic Preservation if the property is eligible for the National Register of Historic Places.

How mitigation measures are used will depend on the physical nature of the resource, the potential project impact, and other factors. Mitigation may range from special project design criteria to be followed during project activities, to protective enclosures around sites, and to systematic monitoring of project activities by specially trained personnel. The most desirable measures, of course, are those which effectively protect the cultural resource in place, are economically sound, and are compatible with other management needs.

The major types of cultural resource mitigation which the Forest has used, and will continue to use, include:

Avoidance

An example is the adjustment of project boundaries which eliminate any physical damage to the cultural resource. Another example is the use of protective physical/visual buffers between the site and the surrounding area of project impact. This is currently the most frequently used measure and the most effective direct protection measures discussed. Avoidance, however, does not increase our knowledge of cultural history, and may not always be the preferred option. Deciding between avoidance and other forms of mitigation requires integration of cultural resource values and opportunities with those of the proposed activity.

Special protective techniques

One example is the yarding of logs by means of predesignated skid roads. Other examples are the directional felling of timber, full-suspension yarding of logs above the surface, and over-snow logging. These measures can be almost as effective as avoidance if properly carried out and if conditions are favorable for a successful completion. However, field conditions can change rapidly (such as snow depth), causing some site damage before activities are halted (Marvin, Susan H., 1982, Philipec, Frances M., 1985).

Special construction methods for historic structures

A basic example is the use of historically accurate or compatible materials in the repair or rehabilitation of existing structures done in keeping with the Secretary of the Interior's "Standards for Historic Preservation Projects." Visually compatible architectural designs for new structures which will be located near significant historic buildings is another example. The effectiveness of this measure will depend on the nature and scope of the proposal. For example, replacement of deteriorated parts with parts made of the same materials, duplicating form, shape, color and texture of the original can be very effective. Generally, smaller scale projects can be more effectively treated than larger scale projects (e.g. - new window installation vs. new building construction).

Relocation or data recovery which is normally undertaken only when avoidance or special protective techniques are not practicable: examples are the removal of a significant structure or object for continuing use or display elsewhere, photo-documentation, and measured drawings and mapping of a structure or object prior to dismantling. Such work would be accomplished according to the standards of the Historic American Buildings Survey, or the Historic American Engineering Record. Partial or full excavation of an archeological site to recover the significant data it contains, executed in keeping with the Advisory Council on Historic Preservation's "Treatment of Archeological Properties: A Handbook," is also a possibility. This measure is very effective in recording the site data and storing those data elsewhere. But by its very nature it is not at all effective in preserving the site in-place, and is therefore used only when other measures are not practicable.

There are no absolute standards that establish what level and kind of project mitigation would be necessary. Each cultural resource is unique, and therefore appropriate mitigation measures will usually be developed on a case-by-case basis as part of specific cultural resource compliance procedures that apply to the project. Programmatic compliance procedures, such as the Programmatic Memorandum of Agreement between the Forest Service, State Historic Preservation Officer, and Advisory Council on Historic Preservation for Depression Era Forest Service Administrative Structures, will be used when these programs apply.

Mitigation measures for illegal activities

Destruction of valuable cultural resource sites and theft of artifacts result from ignorance of the laws and actual criminal intent. Recreationists, unaware of the laws, may casually collect artifacts from the surface. Others, more intent on their hobby may make a point of "arrowhead hunting", unaware of the information they are destroying. The commercial collectors are very familiar with the laws, yet engage in illegal excavation and collection as a lucrative commercial endeavor. Just as the reasons for the threat to cultural resources range from ignorance to criminal intent, so must the mitigation measures range from education to law enforcement.

To reach the general public and those who may not be aware of the sensitivity of the resource or laws protecting it, the Forest is increasing the number of interpretive opportunities. These opportunities include signed archeological sites, public excavations, tours of Forest cultural resource sites, educational programs to various groups, popular publications. Hopefully, education and increased awareness will result in a decrease in the casual collection of artifacts. It may also indirectly affect the activities of the commercial collector if more casual Forest visitors are encouraged to report suspicious activities.

When education fails, law enforcement becomes necessary. The Archaeological Resources Protection Act (ARPA), prohibits excavation or collection of Indian artifacts from federal lands. Illegal excavation resulting in damage to the archeological value of a site in excess of $500 is a felony. Criminal penalties under ARPA are $20,000 and two years in prison for the first offense and $100,000 and five years in prison for a repeat offense.

None of the alternatives would deny Native Americans access to areas of traditional significance. However, various alternatives would make access to specific resource areas either more difficult or easier. The amounts of land allocated to various management strategies would influence the potential availability and supply of traditional resources.

Potential Conflicts with Plans and Policies of Other Jurisdictions

Please refer to the end of this chapter for a discussion of the possibility of conflicts between the alternatives and the plans and policies of other jurisdictions with responsibility or authority for this environmental component.

New Perspectives in Forestry

"New Perspectives in Forestry" is an extension of classical forestry methods with emphasis on linkages between elements of ecological systems and our own management objectives.

The effects of New Perspectives would vary by alternative, because of the difference in emphasis between Management Areas. New Perspectives concepts are still developing and we do not yet know how they will be implemented, therefore it is not possible to quantify effects by alternative.

Things to take into account are:

- Effects on vegetation will be more complex and difficult to fully evaluate.
- Biomass productivity would be enhanced by reinvestment of nutrient capital.
- Amount of wood meeting industrial specifications for lumber and other wood products would be reduced.
- Structural diversity of vegetation would be increased. Some trees would be left uncut in timber harvest areas.

- Greater structural diversity would favor a broader array of wildlife species, but populations of some individual species would be diminished overall.
- Density of hemlocks and true firs would increase. The proportion of Douglas-fir in many stands would be diminished over the long run.
- In terms of changes on the landscape, New Perspectives would be very different from forestry practiced in the recent past. Past management emphasized smaller, widely dispersed harvest cutting units. New Perspectives would often involve larger harvest cutting units with more uncut area between them, and each harvest cutting unit would have a significant complement of reserve trees. Managing timber in larger blocks is intended to minimize fragmentation of habitat characteristics and increase effectiveness of the environment for species that require larger expanses of old-growth vegetation.
- Minimum fragmentation strategies of New Perspectives will need to be integrated into visual management objectives.
- Visually, stands managed under New Perspectives would appear more natural in the middleground and background perspective. In the near foreground view, stands would appear somewhat messy and may be more difficult to traverse because of the increased amount of slash.
- Management costs are expected to increase; some increases may be substantial.
- Stands would be more hazardous for forest workers, because of the potential increase in dying, dead, and down material.
- Some residual trees and new regeneration would be damaged during repeated entries.
- Multiple entry logging may lead to more soil compaction on the average.
- Initially it appears that yields may be reduced. The managed yield tables account for some reduction, but the amount is an estimate. Scientific study is needed.
- Diseases like dwarf mistletoe and laminated rootrot would be more difficult to control because isolation the most effective technique to control them is reduced.
- Escaped fires could be more difficult to isolate because fuel profiles would be continuous over a greater expanse.
- Windthrow would be more widespread. There is no assurance that reserve green trees in harvest units would survive windthrow over the long run.

In summary, New Perspectives would have more structural diversity, more diverse habitat for animals, more natural appearance from a distance, some increased costs, and more stable total biomass productivity. Economically, the value of some of the biomass would diminish, while others may increase due to changing standards, preferences, demands and values.

Potential Conflicts with Plans and Policies of Other Jurisdictions

The following statements are provided to help define areas of potential differences between the proponent of the action (USDA Forest Service) and the policies, management, and enforcement responsibilities of other agencies.

Vegetation

Timber harvest activities may increase sedimentation in streams used for public water supplies. Water districts or municipalities may object to timber harvest on National Forest land in watersheds which feed their water supplies.

All methods of vegetation management including the use of chemicals would comply with the Regional Environmental Impact Statement for Managing Competing and Unwanted Vegetation. Burning of vegetation and debris would also comply with the State of Oregon Smoke Management Plan.

Forestry Program For Oregon

In accordance with 36 CFR 219.7, plans and policies of other Federal, State, and local governments and Indian Tribes must be considered in the land management planning process. The Forestry Program for Oregon (FPFO) represents the State of Oregon's objectives for management of forestlands within the State. The current FPFO, adopted January 3, 1990, by the Oregon Board of Forestry, is significantly different than the FPFO analyzed in the draft EIS. The FPFO (1982) assessed in the draft EIS included timber outputs assigned to the various categories of landowners required to accomplish the coordinated programs contained in the FPFO. The volume figures previously provided to the national forests, including the Mt. Hood National Forest, are no longer part of the FPFO.

The current FPFO focuses on intent rather than on specific numbers and reflects a broader interest in all forest uses and resources instead of focusing on timber production.

The following summarizes the objectives of the Forestry Program for Oregon and discussion of it's consideration in the Final Environmental Impact Statement for the Forest Plan.

Objective

Preserve the forest land base of Oregon and assure practical forest practices that conserve and protect soil productivity and air and water quality by:

Developing land use recommendations which recognize that forests are dynamic and most forest uses are compatible and which emphasize the integration of forest land use.

Discussion

The Forest has developed standards and guidelines (chapter 4 of the Forest Plan) designed to integrate forest uses. These standards and guidelines apply to all alternatives.

Encouraging Federal agencies to maintain as large and as stable a commercial forest land base as possible and to minimize future withdrawals from this land base.

Discussion

Table II-2 (Chapter II) summarizes the timber management information for the FEIS. The land base tentatively suitable for timber management is 678,442 acres. Alternative C devotes a high of 63% of the tentatively suitable land base to full yield timber management. Alternative H is low at only 2% of the suitable land base devoted to full yield management.

Recommending that habitat should be managed based on sound research data and recognizing that forests are dynamic and that most forest uses are compatible over time.

Discussion

The standards and guidelines for all fish and wildlife habitats are based on the most current knowledge of local and state experts.

Cooperatively establishing forest management standards and regulations for the protection of necessary habitat; these standards and regulations are based on the best knowledge available and are consistent with responsible forest management.

Discussion

The standards and guidelines for fish and wildlife were coordinated with the Confederated Tribe of Warm Springs, the U.S. Fish and Wildlife Service, and the Oregon Department of Fish and Wildlife.

Objective

Promote the maximum level of sustainable timber growth and harvest on all forestlands available for timber production, consistent with applicable laws and regulations, also considering landowner objectives by:

> Promoting timber growth and harvest on public lands in a manner consistent with the governing statutory direction, while seeking to meet Oregon's timber needs through the application of enlightened land and resource management.

Discussion

The long-term sustained yield is an indicator of the degree in which an alternative attains the total biological potential of timber growth and harvest. Please refer to Table II-9, Chapter II.

Supporting the use of intensive timber management practices where those practices are professionally, environmentally, and economically sound.

Discussion

Figure II-1 (Chapter II) and Table IV-9 (Chapter IV) shows the management intensity chosen for all acres with a programmed harvest. The intensity chosen optimizes present net worth and meets all alternative resource coordinating requirements.

Objective

Encourage appropriate opportunities for other forest uses, such as fish and wildlife habitat, grazing, recreation, and scenic values on all forest lands, consistent with landowner objectives by:

Encouraging a full range of recreational opportunities on both public and private lands consistent with landowner objectives.

Discussion

Table II-27 shows how responsive each alternative is in meeting developed recreation site demand, providing a range of recreation opportunity spectrum settings, and managing areas of dispersed recreation.

Promoting adequate funding for the full implementation, operation, and maintenance of forest recreation facilities, including trails and campgrounds on public forestlands allocated for forest recreation.

Discussion

For all alternatives, recreation capital investments are approximately $3.1 million/year, and trails capital investments are approximately $2.7 million/year. The emphasis is on reconstruction/rehabilitation of facilities to an acceptable level of service. Some new construction also occurs.

Objective

Devise and use environmentally sound and economically efficient strategies to protect Oregon's forest from wildlife, insects, disease, and other damaging agents by:

Encouraging cost-effective Federal fire management policies that emphasize planned ignition fires over natural ignition fires and that consider impacts to the State of Oregon's Forest Fire Protection Program.

Discussion

It is Forest Service Policy to conduct fire management planning that establishes the most cost-effective funding level for the fire organization. All alternatives provide for the use of planned ignition fires and are part of the cost-effectiveness analysis of the fire organization.

Encouraging that Federal plans which develop and implement fire suppression policies at both the State and national levels be coordinated with the State.

Discussion

Fire suppression policies are developed at the national and regional levels and are above the scope of the Forest Plan. Suppression activities are coordinated with the local state fire suppression organization.

Promoting the effective use of integrated pest management as a coordinated approach to the selection, integration, and implementation of pest control actions.

Discussion

Integrated pest management is a forestwide standard and guideline. All activities are approached with integrated pest management as a major consideration. Pest management specialists have been assigned to this Forest and are available for project design and consultation.

Cultural Resources

The Oregon State Historic Preservation Office is in the early stages of preparing a Statewide Comprehensive Historic Preservation Plan. No conflicts have been noted between the Forest's cultural resource management and the draft Statement. Management of the Forest will be coordinated with the final State plan.

The land uses designated in the Comprehensive Land Use Plan of the Warm Springs Reservation are entirely compatible with the present management of Forest lands adjacent to the Reservation. Those lands designated as forest on the Reservation are adjacent to lands on the Forest currently managed for timber production. The lands designated as recreation on the Reservation are adjacent to the Olallie Lakes area on the Forest. This area is currently being managed as a Special Interest Area with emphasis on recreation and scenic values. The lands designated as Wilderness on the Reservation are adjacent to the Mt. Jefferson Wilderness on the Forest. The coordination of Forest activities with the Confederated Tribes is a Forest policy that will be maintained. Coordination in managing of fisheries habitat between the two agencies is very close because a number of streams originating on the Forest flow into the Warm Springs Reservation.

Minerals

The effects of implementing any alternative may conflict with the objectives of others and federal mining laws. The Mining Law of 1872 predates all other laws that govern Forest Service activity. Because of this and the changing values and increased demand of other resources, conflicts do arise between administration of mining and other resources such as visuals, wilderness, water, sensitive wildlife,plants, wild, scenic and recreational rivers and recreation.

Water

General

Implementation of the State Water Quality Management Plan on lands administered by the Forest Service is described in a Memorandum of Understanding (MOU) between the Oregon Department of Environmental Quality (DEQ) and the Forest Service (dated 2/79). "Attachment A", referred to in the MOU, is the document entitled "Implementation Plan for Water Quality Planning on National Forest Lands in the Pacific Northwest, 1978". This MOU and plan provide the basis for the interagency agreement whereby the Governor of the State designates the Forest Service as the implementing agency for nonpoint source pollution control on lands administered by the Forest Service. This agreement has been updated with a Memorandum of Agreement (MOA) 1990, between the DEQ and the Forest Service, pursuant to Section 319 of the Clean Water Act (see Appendix H).

The 1979 agreement provides for annual meetings between the Pacific Northwest Region of the Forest Service and the DEQ to evaluate the program and progress being made and provides the basis for recertification by the Governor. Available monitoring information is reviewed, revisions or additions to the best management practices are addressed, progress on problem identification and treatment is provided, and reports are written and submitted by the State to the Environmental Protection Agency (EPA).

In compliance with Section 319 of the Clean Water Act, DEQ has issued the "Oregon Clean Water Strategy" to provide a strategic management plan for the prevention and correction of non-point source water quality problems. The Forest will work with DEQ to resolve the water quality status of waters on the Forest.

Cumulative Effects

Timber harvesting has occurred on much of the private land adjacent to the Forest at one time or another. Conflicts may exist between State administration and enforcement of Best Management Practices BMP's on private timber harvest activities versus those practices implemented through the Forest's policies, Standards and Guidelines, and BMP's. Forest Service BMPs are in conformance with the Memorandum of Understanding between the State of Oregon and the Forest Service (see Water Quality section below). Management of the Bull Run watershed is guided by PL 95-200 and the Memorandum of Understanding between the Forest Service and the City of Portland.

Water Supply

During the summer months the demand for water often exceeds supply, especially on the east side of the Forest. The Federal requirements and authorities for maintenance and protection of the resources may conflict with the State's administration of water rights.

Water Quality

Appendix H of the Forest Plan describes the process for determining appropriate BMP'S and ensuring their implementation at both the Forest Plan and Project level. Potential for conflicts exist over jurisdictional responsibilities, problem identification, interpretation of potential management activity impacts on water quality, and the selection, effectiveness, and appropriate monitoring level for BMP's. Implementation of the State Water Quality Management Plan on lands administered by the USDA Forest Service is described in Memorandum of Understanding between the Oregon Department of Environmental Quality (DEQ) and USDA Forest Service (2/12/79 and 12/7/82), and "Attachments A and B" referred to in this MOU (Implementation Plan for Water Quality Planning on National Forest lands in the Pacific Northwest 12/78 and BMP's for Range and Grazing Activities on Federal lands, respectively).

This Memorandum of Understanding provides the basis for the interagency agreement whereby the Governor of the State designates the Forest Service as the implementing agency for nonpoint source pollution control for lands under its jurisdiction. The agreement provides for annual meetings between the Pacific Northwest Region of the Forest Service and DEQ to evaluate the program and progress being made, and provides the basis for recertification by the Governor. Available monitoring information is reviewed, revisions or additions to the BMP's are addressed, progress on problem identification and treatment is provided, and reports are written and resubmitted by the State to the U. S. Environmental Protection Agency (EPA).

Compliance with State requirements for protection of waters of the State of Oregon (Oregon Administrative Rules, Chapter 340-41) will be achieved through planning, application and monitoring of BMP's, in conformance with the Clean Water Act, regulations, and Federal guidance issued thereto.

Fire

Only minor conflicts are expected in the areas of fire prevention and detection. These conflicts will be resolved through modification of existing Cooperative Agreements and Operating Plans.

The Forest's use of appropriate suppression response is expected to cause minor conflicts with the agencies which are responsible for wildland fire protection on lands adjacent to the National Forest. These conflicts will be resolved as the other agencies gain a better understanding of the Forest's suppression response concept and have an opportunity to view its application.

Alternatives that call for high levels of slash treatment would require close and careful coordination with the Oregon Department of Environmental Quality to avoid conflict with its policies. More information on this subject is provided in the section of this chapter that discusses air quality.

Air Quality

The State of Oregon has put into effect an Oregon Smoke Management Plan setting up "designated areas" where high population or recreation sites, such as some Wilderness Areas, call for restrictions on smoke production. All of western Oregon and small parts of eastern Oregon are restricted areas in which smoke emissions are monitored through the burning permit system. The Forest Service will remain in compliance with smoke-emission restrictions in all alternatives. All prescribed burning operations would be conducted in accordance with the Oregon Smoke Management Plan (OAR 629-43-043). The actual burning operations would be further regulated by Oregon State Forestry Directive 1-4-1-601, Operational Details for the Oregon Smoke Management Plan. Potential conflicts exist between Federal land managers and the agencies of each state (Oregon State Department of Environmental Quality and the Oregon Department of Forestry) responsible for the regulation of forestry and wildland burning operations. This conflict would revolve around the state agency's commitment to clean air and the Forest's goal of meeting management goals and objectives.

Another area of potential conflict exists between adjoining National Forests, other State and Federal land management agencies, and corporate and private land owners. The conflict here will be a question of burning priorities, i.e., who gets to burn which units on days when only limited burning is allowed.

A third area of potential conflict involves the Class 1 areas managed by other Federal land managers. Smoke from prescribed fire activities on the Forest could intrude into these Class 1 areas, creating interdepartmental as well as political dissatisfaction. The reverse is also true for smoke that could intrude in the Class 1 area managed by the Forest from activities off the Forest.

Wildlife

The Mt. Hood National Forest manages Forest land to meet many management and resource objectives. Some land management activities do not maximize wildlife habitat potential. As a result, land management activities can conflict with the goals and objectives of other agencies such as the Oregon Department of Fish and Wildlife (ODFW).

ODFW has offered goals for deer and elk populations on National Forests. Alternatives NC, A, C, and E will not meet these objectives because these alternatives will produce dramatic swings in populations. Alternatives F and Q will result in dampened cycles. Alternative H will likely produce more stable populations at lower levels. Alternative I is likely to produce higher population levels which are more stable.

Responses to potential conflicts with other jurisdictions are discussed in Appendix J.

Visual Resources

Highway 26 has been designated a Scenic Roadway by the State of Oregon, and this measure controls advertising along this route. Clackamas County has designated several routes as Scenic Roadways including Highway 26, Highway 35, Truman Road, Lolo Pass Road, Salmon River Road, Timberline Road, West Leg Road, and Old Highway 35. (For additional information, consult CH2M/HILL, Clackamas County Planning Dept., Mt. Hood Community Plan, December, 1976.)

The Multnomah County Comprehensive Plan contains an overlay zone for areas of "significant environmental concern." This zone applies to the Columbia River Gorge within Multnomah County. One of the environmental concerns is scenery.

The Hood River County Comprehensive Plan contains objectives and policies which recognize the scenic and historic values in the Columbia River Gorge. These are intended to control developments on private lands in the Gorge within Hood River County to insure compatibility with natural values.

While the State of Oregon and its counties do not have jurisdiction over federal lands, some of the Forest Plan alternatives, specifically B and C, would apparently generate conflicts with scenic road/scenic area policies of the counties by converting certain viewsheds from Natural Appearing and Slightly Altered to a Moderately or Heavily Altered visual condition.

Unroaded Areas

Management of an area as unroaded reduces the amount of timber harvest. Alternative C, that allocate the maximum number of suitable acres to intensive timber management, are most compatible with the objectives of the Forestry Program for Oregon (FPFO) designed by the State Forestry Board. The alternatives that maintain unroaded areas move further from achievement of target levels as described in this plan.

Conversely, the alternatives that maintain the greatest number of unroaded areas and acres are most compatible with the objectives of the Oregon State Parks, Statewide Comprehensive Outdoor Recreation Program (SCORP).

Special Interest Areas

No significant conflicts are known at this time. Land uses designated in the comprehensive Land Use Plan of the Warm Springs Reservation indicate that the area next to Olallie Lake on the reservation is for recreation purposes. Although the Olallie Lake area would be allocated to various management areas in the alternatives, its primary use as a recreation area is not expected to change.

Improvements

Cooperative agreements and Memorandums of Understanding with Bureau of Land Management, State of Oregon, counties, and private parties concerning roads will need to be considered in the implementation of the Forest Plan. State agency direction concerning elk management will affect road closures. The Forest borders other National Forests and a National Scenic Area. Where cross haul occurs from timber harvest these agencies and Forests shall be considered in the location, design, construction, maintenance and management of roads.

Aquatic Resources

There are a number of plans and policies formulated by other parties with regard to the management of the aquatic habitat. Most of these plans and policies have elements that deal specifically with fish habitats. In general, they address two basic elements of fish habitat:

- The protection and maintenance of existing habitat.
- The restoration, rehabilitation, and/or enhancement of fish habitat.

Five pertinent plans or programs are:

- The Columbia River Basin Fish and Wildlife Program, 1984. Northwest Power Planning Council). This plan was prompted by passage of the Pacific Northwest Electric Power Planning and Conservation Act of 1980 (P.L. 95-501). This plan emphasizes the restoration of Columbia River anadromous fish runs diminished by basin-wide hydroelectric development and operation. Restoration provisions include protecting fish survival, encouraging their reproduction, and rehabilitating and enhancing their habitats in the Columbia River and its tributaries.
- Comprehensive Plan for Production and Management of Oregon's Anadromous Salmon and Trout, 1982 (Oregon Dept. of Fish and Wildlife). This statewide plan deals with all major anadromous species. Habitat management considerations focus on the maintenance and improvement of anadromous fish habitat.
- Oregon Wild Fish Policy (Oregon Dept. of Fish and Wildlife). This policy formally recognizes the need for habitat-based, wild, and natural fisheries production.
- Willamette Basin Fish Management Plan, 1990 (Oregon Dept. of Fish and Wildlife). A key feature of this plan is a section that emphasizes the importance of maintaining fish habitat to insure fish populations remain at high levels.
- SubBasin Fish Management Plans, for the Clackamas, Sandy, and Hood River systems, 1989 (Oregon Dept. of Fish and Wildlife). A key feature of these plans is a section that emphasizes the importance of maintaining fish habitat to insure fish populations remain at high levels. These plans are currently being reviewed and approved by the Fish and Wildlife Commission.

All alternatives, except NC and C, indicate general maintenance of the Forest's aquatic habitat and therefore appear to be generally consistent with such goals. In Alternative NC, declines in aquatic habitat capability are projected in both short and long-term time periods. Any such decline appears inconsistent with the aforementioned plans/programs.

Proposed rehabilitation and restoration efforts center primarily on maintaining existing production capability levels of the habitat. Alternative C falls into this category. Alternatives E, Q, F, H, and I project future increases from current levels in the production capabilities of Forest aquatic habitat. These alternatives are therefore fully consistent with the identified plans and programs. In this group of alternatives, E would produce the least substantial increases.

Probable Adverse Environmental Effects Which Cannot Be Avoided

Implementation of any of the alternatives would inevitably result in some adverse environmental effects. The severity of the effects can be minimized by adhering to the direction in the management prescriptions and Standards and Guidelines in Chapter IV of the Forest Plan. Some impacts, however, generally cannot be avoided if management activities are implemented.

Cultural Resources

The forestwide Standards and Guidelines and Forest Plan Monitoring plan are designed to ensure that known cultural resources and those discovered during land management activities are protected and mitigated from adverse effects. Current inventory methods are designed to locate all significant cultural resources. However, due to variable field conditions, ground visibility during survey, the preservation qualities of cultural remains, and other factors, all sites may not be located during the inventory. If they are not discovered and protected during project activities, some significant sites may be inadvertently damaged or destroyed. Cultural sites located in Wilderness Areas, along Wild and Scenic Rivers and in other areas where project activity (and thus cultural resource inventory) is limited 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 in limited project activity areas.

Mitigation of adverse effects through archaeological data recovery usually does not eliminate all physical trace of the site. Even with modern techniques, the shear quantity of data would be too cumbersome to analyze. Such archaeological excavations customarily remove a sample percentage of data and artifacts suitable to the expected project impacts and data recovery research design. In some cases mitigation will release the affected acres for other project activity; in others, certain activities may still carry protective restrictions.

Improvements

The construction of new roads will have a long-lasting impact by changing the line, color, texture, and vegetative growth along the road as viewed by the Forest user. As an access for recreation, timber, and administration activities, use causes wear on roads and trails. The wear effects can be mitigated by maintenance or reconstruction activities.

Developed recreation sites are susceptible to use and vandalism effects. Some impacts can be mitigated through maintenance, reconstruction, and various preventative or enforcement methods applied to vandalism problems.

Wilderness and Unroaded Areas

The primitive (undeveloped and trailless) character of existing Wildernesses will be degraded to a limited extent due to trail construction.

The existing Wilderness potential in any of the inventoried roadless areas would be foregone under alternatives where these areas are allocated to some form of development.

Mineral exploration and development will be prohibited or restrained in designated Wildernesses.

Soil and Water

Although the Forest Standards and Guidelines, BMP's, and Monitoring and Evaluation Plan have been designed to prevent significant 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 take place which disturb the vegetation and soil. Sediment will be produced by surface erosion, channel erosion, and landslides.

State and Federal water quality standards for turbidity may not be met temporarily, nor in some specific locations, because of the difficulty in preventing all soil erosion from newly disturbed sites. A greater rate of landsliding will occur in clearcut units and along roads than in unmanaged or existing stable areas.

However, BMP'S currently being implemented, coupled with the Standards and Guidelines and monitoring, will prevent or mitigate any major or highly adverse soil and water impact to the established beneficial uses. In addition, the Forest will coordinate with the State water quality agency and the EPA in regard to BMP'S implementation. Current practices will be continually updated when new information or improved methods are developed which are both technically correct and practical in application.

Sediment and turbidity originating from areas being managed for timber production have the greatest potential to adversely impact fish habitat. Stream water temperatures will 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 are or have a good probability of adversely impacting the soil or water resource will be treated through watershed restoration or rehabilitation improvement projects.

Fire

Impacts to the total array of Forest resources from wildfire cannot be totally avoided; wildfires will continue to occur. Their occurrence will be random in both time and space, but areas with the highest probabilities for an ignition can be identified. The severity of the impact will be dependent on the intensity of the fire, and this will be determined by site-specific parameters such as fuel loading, weather conditions, and topography.

Short-term loss of soil that is due to the construction of firelines and the loss of vegetation will occur, despite preventive measures. The buildup of fuels will continue in areas protected by a fire exclusion philosophy. 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 the fire will remain visible for a short time, and the location of a major fire will remain visible through the vegetation for decades. Smoke will be produced.

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 and natural fuels, and from wildlife habitat maintenance. The severity of these impacts will be dependent on the intensity and duration of the prescribed fire. Normally the prescription will be designed so that the activity is implemented to achieve an acceptable level of impact to the target and nontarget resource values.

Vegetation

Implementation of Standards and Guidelines in the proposed action allows protection of sensitive plant sites. This can affect the amount of timber, minerals, and grazing resources available for consumption.

Air Quality

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, and generally at times and under conditions that produce more TSP than a prescribed fire of equal size. In addition, these will usually occur under meteorological conditions which are not conducive to good smoke dispersal.

Prescribed fire is a necessary, integral part of resource management on the Mt. Hood National Forest. When prescribed fire is utilized, there is smoke.

Road construction, silviculture practices such as the aerial application of herbicides, and motorized recreation all will contribute in one degree or another to the temporary degradation of air quality on the Forest.

Wildlife

Under all alternatives, except H and I, the amount of mature and old growth forest will be significantly reduced over the planning period. Populations of wildlife species dependent on mature/old growth forests, such as pileated woodpeckers, pine martens, and spotted owls, will be reduced. Reduction of Pine/Oak habitat would occur under all alternatives, but would be most dramatic under NC, A, and C.

Wildlife species will be temporarily and occasionally permanently displaced when habitat is disturbed or removed by timber management, facility development, recreation use, and road building.

Decreases in snag habitat for cavity dependent wildlife will occur due to timber harvesting, firewood cutting, and salvage programs. A corresponding decrease in cavity dependent wildlife species is expected under all alternatives.

Visual Resource

Standards and Guidelines for visual resource management specify Visual Quality Objectives (VQO) for each management area. The VQOs of Retention and Partial Retention provide for alterations which do not dominate over the natural landscape character. The VQO of Modification provides for alterations which dominate over the natural landscape character, but borrow elements of form, line color, and texture from the landscape setting to the extent and scale, that the alteration blends in with natural landscape patterns. In the foreground and to some extent in the middleground distance, viewers may find the alterations to be excessive in terms of their own expectations.

Relationship Between Short-Term Use and Long Term Productivity

Wildlife

Under all alternatives it is assumed that all wildlife species will be assured of long-term population viability. Under alternatives NC,A,C,E, a significant reduction of mature/old growth habitat may have a deleterious effect on those species dependent on mature/old growth habitat. In all alternatives, except H, long term reductions of all mature/old growth dependent species will occur. Long-term reductions of cavity dependant species will also occur, as snag/cavity habitat will be reduced under all alternatives. Long term decline in deer and elk numbers can be expected alternatives NC, A and E.

Diversity of Plant and Animal Communities

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 dominated by natural processes. In actively managed areas, the health and productivity of the landscape is a concern. Therefore, the risk of diversity loss and long term productivity is least in those alternatives which are less consumptive.

Irreversible and Irretrievable Commitment of Resources

An irreversible commitment of resources results from a decision to use or modify resources which are renewable only over a long period of time. Nonrenewable resources, e.g., rock resources, minerals, etc., are an irreversible commitment once used. An irretrievable commitment of resources refers to resource production or the use of a renewable resource that is lost because of land allocation and/or scheduling decisions. In other words, opportunities are foregone for the period of time that the resource cannot be used. The Forest Plan and the alternatives examined are all based on the principles of multiple use and long-term productivity for all resources. Measures to protect natural resources which could be irreversibly affected by management practices are incorporated into the Standards and Guidelines of the Forest Plan.

Cultural Resources

Timber harvest, facility construction, visitor use, theft, and vandalism may destroy irreplaceable archeological and historical sites. These sites can be damaged by project activities that disturb previously unidentified sites. They can also be impaired by requiring the removal of cultural resources in conflict with project activities. The common mitigation method used before a site is removed is to undertake a data recovery or documentation program of the site. Mitigation through data recovery is essentially the scientific and controlled destruction of a cultural resource site. Once undertaken, the effects of data recovery are irreversible; this mitigation measure represents an irretrievable commitment to the resource. These programs can only recover part, not all of the significant values contained by the site. Much of the important aspects of cultural 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 irrepairably disturbed, these values are permanently lost.

Energy

The use of fossil fuels in the administration of the National Forest is an irreversible resource commitment. Alternatives vary only by the amount; none abstain from use.

Improvements

Because the majority of the roads constructed on the Forest traverse steep ground slopes, they become permanent features on the landscape. Many roads which are scheduled for reclamation do not return the land to the prior productive state. For these and all other roads on the transportation system, there is a definite long-term loss of either some or all of site productivity within the excavated road prism.

Although rock used for surfacing can be found in many places, once it is ground to dust by traffic on the road or broken up by weathering agents, it can no longer retain the desired characteristics.

Wilderness and Unroaded Areas

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. However, this is more a preference than real as evidenced by existing developments when specific areas were designated as Wilderness on this Forest and elsewhere.

Wild and Scenic River

Designation of the inventoried Wild and Scenic Rivers would permanently reduce or prohibit timber harvest. Mineral exploration and development is also restricted or prohibited. Opportunities for the construction of dams, diversions, and hydropower development are prohibited.

Soil and Water

There is an inherent risk of accelerating landslides, erosion, and other changes in the soil physical and biological properties when harvesting timber and building roads in the steep, rugged terrain on the Forest. Debris avalanches, when they occur, often scour to bedrock. Surface and channel erosion, severe soil compaction and displacement, damage to proper functioning of soil biological processes, etc., could lead to either a 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 Standards and Guidelines are designed to avoid or minimize the potential for irreversible losses from the proposed management practices.

Fire

There is no irreversible commitment of resources associated with the 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.

Vegetation

Grazing allotments may be restricted to protect sensitive plant species. This would constitute an irretrievable loss to the permittees.

Old-growth forests, once harvested, are considered an irretrievable loss. Once harvested, the stand begins anew. To again develop old-growth forest characteristics will require approximately 200 years. Insects, disease, and fire can also contribute to this loss. If left unmanaged, stand decadence may alter the 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.

Air Quality

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, Piling Unmerchantable Material, chipping, and burying will, however, require the irretrievable commitment of fossil fuels.

Wildlife

Old-growth habitat for wildlife, once harvested, cannot be replaced through regrowth over the planning period. For example, a loss of old-growth within winter range would equate to irretrievable loss of optimal cover for deer and elk. Under alternatives F,H,I and Q special old growth areas would be established to protect ecologically significant old growth stands. However, under all alternatives (except H), overall acreage of old growth habitat would continue to decline on the Forest. There is some risk that the number, size, and dispersal of mature/old growth habitat allocated to the indicator species may not be sufficient to maintain viable populations over time.

Grazing allotments constitute an irretrievable loss of foraging habitat for deer and elk, unless this land is reallocated.

Diversity of Plant and Animal Communities

Species extinction is irreversible. It is essential that habitat for sensitive, threatened and endangered species be maintained or enhanced.

Visual Resource

The commitment of Forest land to development of permanent facilities, such as roads, rock pits, and utility corridors constitute an irreversible and irretrievable commitment of the natural appearance of the landscape in most cases, although efforts are made to mitigate these effects.

Recreation Settings

The commitment of the Forest's unroaded areas to timber production constitutes an irretrievable loss of the primitive character required to maintain the physical and psychological settings necessary for Primitive and Semi-primitive Non-motorized recreation experiences.

Environmental Effects Unchanged by Alternatives

Some of the resources on the Forest are not affected by implementation of any of the alternatives. More often, the activity-induced impacts are either similar or conditions of the environment remain unaffected.

Land Allocations

The relationships of National Forest planning to statewide planning programs is briefly discussed herein. In Oregon, the Land Conservation and Development Commission (LCDC) sets overall rules for planning decisions; cities and counties adopt plans which meet the statewide requirements. Statewide Planning Goals are Oregon's standards for comprehensive planning. Of the 19 Goals, a number are strongly interrelated with management of the Mt. Hood National Forest, a few are indirectly related, and several others have little or no bearing on or from the Forest's uses, activities, or outputs.

The alternatives either complement, meet, or exceed the Statewide Planning Goals. Proposed activities that would be implemented under the alternatives comply with the Goals, are compatible with county comprehensive plans and land use regulations, and conform with various State agency statutory authorities. Input and coordination on a wide array of planning topics has been ongoing between the Forest and adjacent counties and State agencies. Planned activities will continue to be conducted consistent with the state management programs.

Mineral Deposits

Roads developed for minerals access and development can add to dispersed motorized recreation opportunities.

Mined-area rehabilitation has the potential to improve fish and wildlife habitat, and restore old erosion and water pollution sources.

Improvements

There will continue to be a road system to serve the needs of Forest users and for Forest management and protection. Each alternative has a transportation system; the only change occurs in extent and management objectives. All alternatives provide for some degree of accessibility for various resources, such as timber management, fire prevention and suppression, recreation, and special uses.

Although it could be increased or decreased in size, the basic arterial road system will remain unchanged. Trails will continue to be present, and will help in the use and protection of the Forest. New road construction will be subject to the project prescription and Standards and Guidelines in meeting the specific management objectives of the area served.

A variety of users will travel on roads and trails they find to be suitable or need upgrading for their needs. All alternatives recognize there will be use at developed recreation sites. There will be continued use of the existing utility and transportation corridors. There will be very little or no change in established use of the existing miscellaneous improvements.

Use of roads during wet ground or freezing conditions can cause excessive damage to the road bed. Limitations in road use permits or suspension of commercial use offers some control of the problem; however, it is recognized that control of public use even with area closures is difficult.

Wilderness and Roadless Areas

The character of the designated Wildernesses on the Mt. Hood National Forest is not expected to change as a result of programmed management activities under any of the alternatives.

Recreation use can have a cumulative effect on the character of the Wilderness. However, the impacts of recreation users are monitored within each Wilderness in order to insure that they do not exceed a point detrimental to the area. Standards and Guidelines will be the primary "tools" used to prevent resource degradation associated with recreation use.

Wild and Scenic Rivers

The "outstandingly remarkable" attributes of the designated Wild and Scenic Rivers are not expected to significantly change as a result of management activities programmed within any of the alternatives.

Both timber harvest and recreation use can have a cumulative effect on the Wild and Scenic River resource. Management (both past and planned) seeks to tailor the degree of management to meet specific objectives designed to protect the character of the Wild and Scenic River corridors regardless of the alternative. Cumulative effects are common to all alternatives and are not expected to vary.

Soil and Water

Naturally occurring landslides, those not related to management activities, will continue to occur under all alternatives.

Annual water yield for the Forest will remain essentially unchanged except for small increases in some watersheds. The additional water produced by the removal of forest vegetation during timber harvest and other management practices represents less than one percent of the total Forest water yield.

With few exceptions, research has shown that timber harvest increases water yield from 5 to 20 years. The magnitude of increase depends on the amount of cutting, vegetation type, soil, geology, and climatic factors. Water yield will decline with time as harvested areas reforest. When the extra water contributed from newly harvested areas is added to the vast areas yielding water at the background level, the increase in water yield becomes insignificant. Harr (1979) succinctly puts the issue of water yield increases into perspective:

"Certain characteristics of water yield increases combine to make such increases in headwaters of basins of little consequence downstream. First, increases tend to diminish over time, so that only a fraction of a watershed managed for sustained production of timber products will be in a condition to yield appreciably more water. The remainder will yield normal or nearly normal flows which tend to mask increased flows from freshly logged upland areas. Examples used by Rothacher (1970), Bethlahmy (1974), and Harr and others (1979) show that forest cutting in large watersheds--about 100 kilometers squared--probably would be only about four to six percent, an amount well within the normal accuracy of streamflow measurement for the large watershed. Management under nonsustained yield of timber products, however, could result in somewhat greater water yields for a large watershed. A second characteristic of water yield increases that bears on the value or utility of increases downstream is their timing. Substantial increases during the fall-winter rainy season will do little to satisfy summer demand for water. This timing, coupled with the fact that water yield increases tend to occur during wet years, further limits the real benefits commonly attributed to increased water yield after timber cutting. To use these increases would require storage facilities; and if storage facilities were present, storage of yield increases would be of minuscule importance compared with storage of normal winter runoff for release during the summer dry period."

Even if sizable increases in water yield were expected, it would be difficult to attribute significant adverse environmental consequences to them. Within the transient snow zone, the possibility exists that harvest clearcuts for reforestation may increase peak discharges within large basins; however, the research to date is inconclusive. Even if large increases in peak discharge result from clearcutting in the drainage basins, the adverse effects and their significance remain to be established.

A positive result of harvest clearcuts and water yield is the increase in streamflow during the critical summer low-flow months. As discussed above, substantial increases in water yield occur per acre harvested, but most of the extra water yield occurs in the large base flow of the winter high-flow months. Whereas the increased flow in the summer period is small, the greatest increase percentage-wise occurs during the summer. Also, current research suggests that the duration of increase for summer low-flows is shorter, perhaps only five years, even though the increase in total annual yield may persist for up to 25 years.

As discussed above, water yield is almost always increased by timber harvest. One exception, however may occur in areas of frequent fog (Harr 1982). Decreases in water yield will likely be of the same magnitude, or less, as the fog increases. Research is not as clear on long-term water yield changes resulting from timber harvest, and particularly if 20- to 100-year old trees transpire more water than slower growing trees. All changes in water yield are expected to be minimal and vary little between alternatives.

Groundwater levels will not be affected by any of the proposed management activities proposed in any of the alternatives. This is the result of the insignificant amount of additional moisture made available for streamflow or aquifer recharge as discussed above.

Fire

The microclimate of the Forest will be modified by management activities such as timber harvest, resulting in an environment more suitable for an unplanned ignition.

Fuel accumulations will continue to increase in areas, such as the Badger Creek Wilderness, that are subjected to a fire exclusion policy. Fuel treatment activities in timber harvest units will reduce material by amounts prescribed through the Standards and Guidelines.

Air Quality

Wildfire smoke will affect air quality and air quality-related values throughout the array of alternatives. Since the occurrence of wildfires is a random event in both time and space, the severity of the air quality impact will vary depending upon fire intensity, fuel type and conditions, size of the fire, and meteorological conditions. Wildfires, and lightning fires in Wilderness that are managed as prescribed fires, are not considered in PM10 production estimates.

Forest protection efforts would occasionally be hampered by smoky conditions. The visibility from fixed detection points (lookout towers) would be reduced and aerial detection capabilities restricted, increasing the probability of a wildfire being undetected for a short period of time. This could lead to more costly wildfires through increased fire suppression costs and resource damage. Wildfire smoke would add to already existing smoky conditions, compounding the visibility impact.

Management efforts to meet air quality standards and direction, and not exceed the PM10 baseline value of 3,900 tons annually, will compound resource management complexities and raise the overall Forest management costs. Day-to-day burning restrictions could limit the actual fuel reduction accomplishments, thereby extending the amount of time and increasing the effort required to complete the necessary prescribed burning. Reforestation efforts, for example, in some harvested units could be slowed or delayed because of inadequately treated or unburned logging slash due to the limited availability of suitable burning days, from a smoke management standpoint. Planting costs could be higher due to additional "scalping" requirements and slower production rates associated with untreated or marginally treated units.

Visual Resource

The visual character of the designated Wildernesses is not expected to change as a result of programmed management activities designed to achieve the Preservation visual objective.

Timber harvest has a cumulative effect on the visual resource within a viewshed. Harvest activities in Retention and Partial Retention areas are programmed on acre per decade limits for each objective (DeWerff and others 1981). The visual condition of the designated viewsheds (B2 lands) will be monitored to insure achievement of the desired future conditions. Standards and guidelines may be amended as necessary to meet the desired future conditions. Harvest levels may be adjusted as necessary to comply with the Standards and Guidelines.

Specifically Required 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 peregrine falcon is the only endangered species which occurs on the Mt. Hood. The bald eagle and spotted owl are the only threatened species that occur on the Forest.

While some of the alternatives would provide greater protection than others, none of the alternatives would have a significant adverse impact on threatened or endangered species. The Forest will comply with all appropriate threatened and endangered species recovery plans, regardless of the alternative. Provision is made in the plan to pursue informal or formal consultation as necessary during project design and analysis. The Mt. Hood does not contain any listed critical habitat areas (as defined by the Endangered Species Act).

Effects of Alternatives on Prime Farm Land, Rangeland, and Forest Land

All alternatives are in keeping with the intent of Secretary of Agriculture Memorandum 1827 for prime rangeland, farm land, and forest land. Regardless of alternatives, Forest Service lands will be managed with a sensitivity to the effects which their management will have on adjacent private and public lands.

The Forest does not contain prime farm lands or rangelands. "Prime" forest land is a term used only for non-Federal land and does not apply to lands within the National Forest System.

Energy Requirements of Alternatives

There are direct and indirect effects upon the energy requirements necessary to carry out the proposed alternatives. The approximate energy requirements for each alternative are listed in Table IV-37.

Table IV-37 Annual MM BTU's for First Decade by Alternative

Alternative	MM BTU
NC	7,473,151
A	5,642,164
C	6,724,242
E	7,741,136
F	3,737,300
H	2,616,110
I	3,977,762
Q	4,619,476

Effects of Alternatives on the Human Environment

Local consumers will be affected by the supplies of various commodities documented previously in Chapter II.

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, i.e., tiny bogs and small ponds, and the position of the limited floodplains in the stream and river area. Mt. Hood National Forest landform is steep and most drainages are tightly confined to a narrow strip and rapidly drained due to stream slope. However, where narrow floodplains do exist, they correspond to the General Riparian and other land allocations which restrict or prohibit management activities and development. Other than existing developments, such as roads and campgrounds, human habitation in the riverine areas on National Forest lands is extremely limited.

Protection is afforded to these areas through BMP's incorporated in the Standards and Guidelines, NEPA analyses, and accompanying management requirements, Executive Orders 11988 (floodplains) and 11990 (wetlands). Collectively, these provide excellent direction to ensure that road construction, campground development, structural placements, and other facilities will not have unacceptable adverse impacts on the wetlands and floodplains. Except along the major river areas, avoidance or measures to protect the high values of these sensitive sites are the normal prescription. Many sites are associated not only with high wildlife values, but often are indicators of major areas of old or recent mass instability.

The riparian ecosystems contiguous to several thousand miles of streams across the Forest are protected and managed through the prescriptions and Standards and Guidelines applied to the General Riparian and other Management Areas that have little or no development activity, and Regional and Forest policy.

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List of Preparers

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FEIS/Plan Role: Forest Wildlife Biologist, Interdisciplinary Team Member

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FEIS/Plan Role: Transportation Planner, Interdisciplinary Team Member

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FEIS/Plan Role: Recreation Planner, Interdisciplinary Team Member

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Years of Planning Experience: 26

FEIS/Plan Role: Forest Landscape Architect, Interdisciplinary Team Member

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Years of Planning Experience: 2 1/2

FEIS/Plan Role: Forest Economist, Interdisciplinary Team Member

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Years of Planning Experience: 2 1/2

FEIS/Plan Role: Writer/Editor, Forest Plan Documentation, Interdisciplinary Team Member

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Planning Document Recipients

Planning Document Recipients

Copies of the Final Environmental Impact Statement (FEIS) and Forest Plan are available for review at the following locations:

Forest Supervisor's Office
2955 N.W. Division
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Barlow Ranger District
P.O. Box 67
Dufur, OR 97021
Phone: (503) 467-2291

Bear Springs Ranger District
Rt. 1, Box 222
Maupin, OR 97037
Phone: (503) 328-6211

Clackamas Ranger District
61431 E. Highway 224
Estacada, OR 97023
Phone: (503) 834-2274

Columbia Gorge Ranger District
31520 S.E. Woodard Road
Troutdale, OR 97060
Phone: (503) 695-2275

Estacada Ranger District
595 N.W. Industrial Way
Estacada, OR 97023
Phone: (503) 630-6861

Hood River Ranger District
6780 Highway 35
Mt. Hood - Parkdale, OR 97041
Phone: (503) 352-6002

Zigzag Ranger District
70220 E. Hwy 26
ZigZag, OR 97049
Phone: (503) 622-3191

Copies of the FEIS and proposed Forest Plan were distributed to the following individuals, organizations, and Government agencies. Those individuals specifically requesting copies of the FEIS and Forest Plan were mailed a copy.

Federal Agencies

Advisory Council on Historic Preservation
- Office of Architectural and Environmental Preservation

Agriculture, U.S. Department of
- Animal and Plant Health Inspection Service
- Forest Service
  - Columbia Gorge National Scenic Area
  - All Regional Offices
  - Region 6 - All Forests
  - Pacific Northwest Forest and Range Experiment Station
  - Rocky Mountain Forest and Range Experiment Station
  - WESTFORNET - North
  - WESTFORNET - South
- Office of Equal Opportunity
- Rural Electrification Administration
- Soil Conservation Service

Commerce, U.S. Department of
- National Marine Fisheries Service
- NOAA, Ecology and Conservation Division

Defense, U.S. Department of
- Air Force
- Army Corps of Engineers
- Deputy Assistant Secretary
- Explosives Safety Board
- Navy
- U.S.A.F. Regional Civil Engineer (western region)
- U.S. Naval Observatory

Delaware River Basins Commission

Energy, U.S. Department of
- Bonneville Power Administration
- Office of Environmental Compliance

Environmental Protection Agency
- Office of Federal Activities
- Region X, EIS Review Coordinator

Federal Energy Regulatory Commission

General Services Administration

Health and Human Services, U.S. Department of

Interior, U.S. Department of
- Bureau of Indian Affairs
- Bureau of Land Management
- Bureau of Mines
- Fish and Wildlife Service
- National Park Service

Labor, U.S. Department of

Transportation, U.S. Department of
- Assistant Secretary for Policy and International Affairs
- Federal Aviation Administration
- Federal Highway Administration
- U.S. Coast Guard

Regional Agencies

Northwest Power Planning Council

Washington and Oregon Gorge Commissions

State Agencies

State of Oregon
- Department of Agriculture
- Department of Energy
- Department of Environmental Quality
- Department of Fish and Wildlife
- Department of Forestry
- Department of Geology & Mineral
- Department of Land Conservation & Development
- Department of Lands
- Department of Parks
- Department of Revenue
- Department of Transportation
- Department of Water Resources
- Budget and Management
- Employment Division
- Executive Department
- Historical Preservation
- Intergovernmental Relations Division
- Marine Board
- Trade and Economic Development

Native Americans

Confederated Tribes of Warm Springs Reservation

Congressional Officials

Oregon
- Honorable Mark Hatfield, US Senate
- Honorable Robert Packwood, US Senate
- Honorable Les AuCoin, US House of Representatives
- Honorable Peter Defazio, US House of Representatives
- Honorable Denny Smith, US House of Representatives
- Honorable Robert Smith, US House of Representatives
- Honorable Ron Wyden, US House of Representatives
- Robert Shiprack, Oregon House of Representatives
- Rick Kotulski, Oregon House of Representatives
- Greg Walden, Oregon House of Representatives
- Dave McTeague, Oregon House of Representatives
- Bob Kintigh, Oregon Senate
- Glenn E. Otto, Oregon Senate
- John Kitzhaber, Oregon Senate
- Wayne Fawbush, Oregon Senate

Washington
- Honorable Brock Adams, US Senate
- Honorable Slade Gorton, US Senate
- Honorable Jolene Unsoeld, US House of Representatives
- Honorable Sid Morrison, US House of Representatives
- Honorable Thomas Foley, US House of Representatives
- Office of the Governor
- Columbia River Gorge Bi-State Commission
  - Richard Benner
  - Stafford Hansell
  - Jim Johnson

County Officials

Wasco County
- James Comini, Commissioner
- John Mabray, Commissioner
- Ray Matthews, Commissioner
- William Hulse, Judge
- Dan Durow, Director of Planning
- Carl Kaser, Weed Advisory Commission Chairperson

Hood River County
- Robert Montgomery, Commissioner
- Jack Mills, Commissioner
- Allen Moore, Commissioner
- Kent Rosemount, Commissioner
- Jerry Routson, Commissioner - Chairperson
- Beverly Rowland, Commissioner
- Dick Kelly, Sheriff

Michael Nagler, Planning Director

Multnomah County
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- Pauline Anderson, Commissioner
- Rich Bauman, Commissioner
- Gretchen Kafousy, Commissioner
- Fred Neal, Commissioner
- Lorna Stickel, Planner

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- Ed Lindquist, Commissioner
- Dale Harlan, Commissioner - Chairperson
- Richard Dopp
- Bill Brooks, Sheriff
- Marilyn Lunner, Extension Agent
- Lt. Pat DeHaff, Search and Rescue

Marion County
- Gary Heer, Commissioner - Chairperson
- Russ Nebon, Chief Planner

Jefferson County
- Judge Daniel J. Ahern, Commissioner - Chairperson
- Dan Valoff, Planning Department

City Officials

City of Maupin
- Sherry Holliday, Mayor
- Florence Woodside, Chamber of Commerce
- Ray Hanson, School District Superintendant

City of Dufur
- Grant Mead, Mayor

City of The Dalles
- Del Ceasar, City Manager
- Paul Koch, City Manager
- Art Labrouser, Sheriff
- Pat McGaughey, Chamber of Commerce
- Bill Keyser, Water Department Director
- John Rayborn, Port of The Dalles
- Susan Huntington, Chamber of Commerce - Executive Director

City of Hood River
- Ken Jernstedt, Mayor
- Tina O'Banion, Chamber of Commerce

City of Cascade Locks
- Moe Maebeck, Mayor
- George Lewis

City of Sandy
- Ruth Landry, Mayor

City of Government Camp
- Bud England, Sanitary District

Cities of Welches and Rhododendron
- Bill Conerley, Mt. Hood Area Chamber of Commerce
- Gene Fisher, Hoodland Fire Chief

City of Estacada
- Tom Nelson, Mayor
- Lyman Houk, Manager
- Scott Clark, School District
- Maureen Stevens, Chamber of Commerce
- Bonnie Parker, Manager

City of Molalla
- Gilbert Stenger, Chamber of Commerce

City of Portland
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- Ralph Saperstein, Chamber of Commerce
- Don Clark, Houcing Authority
- Edward Tenney, Water Bureau
- Bruce Niss, Water Bureau
- Jim Simmons, Chamber of Commerce
- Donald McClave, Chamber of Commerce

City of Gresham
- Gussie McRobert, Mayor
- Terry McCall, Chamber of Commerce
- John Anderson, Community Development
- Tom Kloster, Community Development

Newspapers

Business Journal
Chronicle
Clackamas County News
Enterprise Courier
Gresham Outlook
Hillsboro Argus
Hood River News
Jefferson Review
Keizer Times
Molalla Pioneer
Portland Business Today
Register-Guard
Sandy Post
The Mountain
The Oregonian
The Villager
Tigard/Tualatin Times
West Linn Tidings
Woodburn Independent
USA Today

Libraries

Clackamas Community College
Douglas Library
Multnomah County Library

Organizations

American Fisheries Society
American Forest Council
American Forest Institute
American Motorcyclist Association
American Rivers
Ancient Forest Village
Anglers Club of Portland
Argonne National Laboratory
Assoc. of Northwest Steelheaders
Assoc. of O & C Counties
Assoc. of Oregon Archeology
Assoc. Oregon Loggers, Molalla Chapter
Associated Oregon Loggers
Audubon Society of Portland
Blue Mountain Sierra Club
Brooklyn Community School
Chamber of Commerce
CHEC
Citizens Interested in Bull Run
City Administration
Clack. Co. Dept. Trans. & Devmt.
Clack. Co. Soil & Water Cons. Dist.
Clackamas Water District
Columbia Gorge Coalition
Columbia Gorge Power
Columbia Group Sierra Club
Columbia River Gorge Commission
Columbia River Inter-Tribal Fish Comm.
Community Development Division
Consulate-General of Japan
Department of Forest Resources
Department of Water Supply & Treatment
Eleventh Commandment Fellowship
Eller Environmental Association
Employment Division
Environmental Defense Fund
Enronmental Earth Science Department
First United Methodist Church
First Unitarian Church Environmental Study Group
Friends of Bagby
Friends of Enola Hill
Friends of Mt. Hood
Friends of the Columbia Gorge
Hood River Co. Forestry Department
Hood River Co. Planning
Hood River Crag Rats
Iregib Small Woodland Association
International Woodworkers of America
Lane County Audubon Society
League of Conservation Voters
Live Wire Riders
Livestock Association
Log Truckers Conference
Mazama Conservation Committee
McKenzie River Gathering
Molalla Area Chamber of Commerce
Mt. Hood Alliance
Mt. Hood Corridor Planning Organization
Mt. Hood Forest Study Group
Mt. Hood Recreation Association
Mt. Hood Snowmobile Club
Mt. St. Helens Club
Mt. States Legal Foundation
Mult. Co. Transportation Division
Mult. Co. Soil & Water Conserv. District
Multnomah Co. Park Services Division
National Audubon Society
National Forest Prod. Association
National Wildlife Federation
National Resources Defense Council
Native Plant Society of Oregon, Corvallis
Native Plant Society of Oregon, Keizer
Native Plant Society of Oregon, Portland
Nature Conservancy
Northwest Environmental Defense Center
Northwest Forestry Association
Northwest Power Planning Council
Northwest Rafters
Northwest Steelheaders Association
Northwest Timber Association (NWTA)
NW Environmental Defense Center
Obsidians, Inc.
OPLAC - Northwest
OR-Cal. Trails Association
Ore. Chapter of Am. Fisheries Society
Oregon Bankers Association
Oregon Council of Rocks and Minerals
Oregon Environmental Council
Oregon Equestrian Trails
Oregon Farm Bureau
Oregon Forest Industrial Council
Oregon Historical Society/Library
Oregon Hunters Association
Oregon Log Truckers Association
Oregon Motorcycle DLRs Assn.
Oregon Natural Heritage Data Base
Oregon Natural Res. Council

Oregon Nature Institute
Oregon Nordic Club
Oregon Rivers Council
Oregon SAF
Oregon St. Parks & Recreation Depatment
Oregon St. Snowmobile Association
Oregon Summer Home Association
Oregon Trail Advisory Council
Oregon Trout
Oregon Tourism Alliance
P.L.T.Y.G./Izaak Walton League Am.
Pine Hollow Recreation Development
Plywood Marketing Association
PNW 4 Wheel Drive Association
Port of Hood River
Port of The Dalles
Portland Audubon Society
Portland Chamber of Commerce
PSU School of Urban & Public Affairs
Rainforest Action Movement
Salmon & Steelhead Anglers of Oregon
School District 29
Sierra Club Legal Def. Fund
Sierra Club, NW Office
Sierra Club - Oregon Chapter
Siuslaw Timber Operators Association
Ski Tek Inc.
Society of American Foresters
Sportsman Park
Texas Committee on Natural Resources
The American Alpine Club
The Dalles Area Chamber of Commerce
The Northwest Power Planning Council
The Oregon Natural Heritage Data Base
The Oregon Nordic Club, The Dalles Chapter
The Rainforest Consortium
The Research Group
The Trust for Public Land
The Wetlands Conservancy
The Wilderness Society
Trails Club of Oregon
Trout Unlimited
Trout Unlimited - Co. R. Chapter 095
Umpqua Valley Audubon Society
United Four Wheel Drive Association
Wapanitia Homeowners Association
Washington Native Plant Society
Western Forest Industries
Wilderness Society
Wilderness Society NW Region
Wildlife Management Institute
Wildlife Society/Oregon Chapter
Winter Organization Oregon
Women's Oregon Trail Riders
W Wood Products Association (WWPA)
Woodland Arborealists
World Forestry Center
Wy'East Climbers
Zigzag Summer Home Association

Businesses

Action Manufacturing
Alko Road Construction
American Messenger Service
American Plywood Association
Amev Investors, Inc.
Samuel L. Anderson Dev. Co.
Avison Lumber Company
Bald Knob Land and Timber Company
Bennett Construction
Black and Company
Bogle and Gates
Brazier Timber Company
Bugaboo Timber Company
Campbell Trucking, Inc.
Canyon Valley Forest Products, Inc.
Cavenham Forest Industries
Coburn Electric
Columbia Helicopters, Inc.
Columbia River Plywood Cooperatives
Columbia River Trucking Co., Inc.
Commercial Bank
Corbett Water District
Crown Zellerback Corporation
Curtis Forest Products
D & M Iverson Lumber
D & R Miller Trucking
Darrel Jones Logging
Dee Forest Products, Inc.
Diamond Hill Plywood Company
Dicks Logging Company
Diehl Lumber Products, Inc.
Dodge Logging
Donald M. Drake Company
Douthit Logging Inc.
Earth Dance Corporation
East Fork Irrigation District
Ellingson Lumber Co.
Ellison Company
Estacada Lumber Company
E. "Val" Prentice Contractors Inc.
Fallon Log Company
Frank Lumber Co., Inc.
4-Point Timber Co.
Fort Vancouver Plywood Co.

Forestglen Lumber Company
Fortune Log Hauling
Frank Lumber Co., Inc.
Freightliner Corporation
Freres Lumber Company
Furman Lumber Inc.
General Chemical
Georgia Pacific Corporation
GM Trucking
Green Ridge Tree Farm
Grim Logging
Hanel Lumber Co., Inc.
Heath Logging, Inc.
Hibbard, Caldwell, Bower, & Schultz
Hood River Electric Company
Hood River Electric Coop.
Iasis Resort in The Deschutes
IFA Nurseries, Inc.
IFPT, Inc.
Industrial Marketing Systems, Inc.
Industrial Valve of Oregon, Inc.
Iowa Interstate R/R
James River Corporation
Kaufman's Streamborn Fly Shop
Lamon Lumber Company
Lane-Miles Standish Company
Larry D. Jones, Inc.
Longview Fibre Co.
Louisiana Pacific Corporation
LSP Constructors, Inc.
Lupine Transportation, Inc.
Manville Sales Corporation
Mason, Bruce and Girard
McGuire Bearing Company
Merrill Lynch World Headquarters
Miller, Nash, Wiener, & Carlsen
Mitsubishi Electric
Moser Lumber, Inc.
Mt. Fir Lumber Co., Inc.
Mt. Hood Meadows Dev. Co.
Mt. Hood Meadows Oreg., Ltd.
Mt. Hood RV Village
Moss Adams, C.P.A.
Mountain Fir Lumber Co., Inc.
Mountain States Legal Foundation
Multnomah Plywood Corp.
Musselmen Assoc., Inc.
North Pacific Lumber Co.
Northern Wasco County People's Utility District
Northwest Cutters, Inc.
Northwest Forest Resource Council
Northwest Futon Company
Northwest Reforestation Contractors
Northwest Timber Association
Oregon Cascade Timber
Oregon Country Tree Farm
Oregon Lumber Company
Oregon Public Broadcasting
Pac Pow
Pacific Building Systems
Pacific Lumber & Shipping Co.
Pacific Marine Technology
Pacific Power
Pacific Wood Products
Plywood Marketing Associate
Parr Trucking
Paul F. Ehinger & Associates
Portland General Electric
Prineville Sawmill Co.
R. Schonborn Logging
RecPro, Inc.
Regon Motorcycle Dlrs.
Reisch Logging, Inc.
Resource Economics, Inc.
River Oaks Farm
Roger Machinery Co. Inc.
Rudolf Gantner, Inc.
Rust International Corporation
RV Life
Saltman and Stevens
Scenic River Logging
SDS Lumber Company
Sequoia Forest Industries
Shiels and Obletz
Silverton Forest Products
Simpson Lumber Company
Ski Bowl
Sky Car Logging, Inc.
Skycraft Marbled Designs
Soloman Brothers, Inc.
Solstice Ski & Sports
Southern Pacific Transportation Co.
Spartee Products Wholesale Lumber
Stevenson Co-Ply
Streamborn Flies
Summit Ski Area
Swift and Swift Realty
The Campbell Group
The Dalles Tire & Auto Center
The Halton Company
Timber Data Company
Timberline Lodge
Times Mirror Land and Timber Co.
Toms Landscaping
TriMac Panel Products, Inc.
Tygh Valley Moulding

United Fire Health & Safety Eq. Co.
United Telephone
Vanport Mfg., Inc.
Viking Forest Products
Waldron Pacific, Inc.
Walton Company
Wasco County Farm Bureau Board
Wasco Electric Cooperative, Inc.
West Salem Machinery Company
Western Wood Products Association
Weyerhaeuser Co.
Weyerhaeuser Company, Ch 1LZG
Wilkinson Trucking
Willamette Valley Company
Yost, Gruber, and Hall
Zip-O-Log Mills, Inc.

Education

Clackamas Community College
Duke University
Estacada Board of Education
Estacada School District
Fresno City College
Humboldt State University
Maupin Elementary School District #84
Oregon State University
Reed College
Tygh Valley Grade School
University of Alabama
University of California
University of Oregon
University of Washington
Willamette University

Individuals

Abrams, Austin
Ackerman, Dick
Achterman, Gail
Adams, L. S.
Adams, John
Adams, Nancy J.
Adams, Paul C.
Adams, Robert
Adams, Thomas C.
Aegerter, Bob
Albrecht, William J.
Alf, Steve
Allegre, Arlene
Altwood, Melvin L.
Alway, Valerie
Amen, Steve
Amicarella, Joe
Amssey, Jay
Anderson, Clarence and Alma
Anderson, D.
Anderson, Mike
Anderson, Otto D.
Anderson, Rick
Anderson, Samuel L.
Andrews, Bill C.
Andrews, Lester
Ansell, Gerald C.
Apple, Bruce
Archibald, Creed
Arnhart, Carol
Ashley, Bob
Austin, Clyde
Austin, Eldon
Ayers, Wednell C.
Babcock, Leell
Backus, Frank
Baker, Allan A.
Baker, Richard
Baker, Tim
Bakke, William
Ballentine, DMD E. Lee
Ball, Frank
Baller, Lloyd E.
Bangs, Harold and Eleanor
Barber, Dormand O.
Barger, John
Barnes, Earl and Marguerite
Barnes, Larry
Barnett, Gary
Barnum, Sara
Barringer, David P.
Baszler, Dan E.
Bates, David
Batey, Irene
Battles, Les
Battles, Toni
Baucom, Stephen R.
Bauman, Dick
Bauer, Mrs. Robert J.
Beachwood, Bud
Beaty, Douglas J.
Bechsel, Edwin J.
Beck, Donald F.
Beck, Merle
Bell, Pam and Robb
Bell, Randy J.
Bell, Rich
Bellitte, Jack
Bellman, Mickey
Belmont, Patricia M.
Benda, E. J.
Benish, E.
Benjamin, Bette
Benner, Richard
Benner, Richard P.
Bennett, Berle B.
Benson, Arden R.
Bentley, Gene
Bentley, Tom
Berger, Cheryl A.
Bergren, Kathleen J.
Beringer, J.
Berke, David
Bernhardt, Jr. Butch
Beshears, Art
Bess, John
Bialkowsky, Karl
Bickett, Gary
Biddle, Gary and James
Bilyeu, Eileen
Bischoff, John
Bishop, Beth
Bishop, Bernice A.
Bitz, Patrick
Black, Val
Blackburn, Chelsea
Blackwell, John
Blades, Art
Blaine, Peter M.
Blair, William L.
Blake, Kipley E.
Blanchard, Lois (Beth)
Blatter, Norm
Bleakney, Darlene
Bliven, Lorraine
Bloch, Marilyn
Blodgett, Chris
Bloom, Gary D.
Boehner, Paul R.
Boeschen, Arthur
Bohlander, John
Boldt, Beanine
Bollinger, Larry and Carolyn
Bone, Steve
Bones, Harry
Booth, Arline
Booth, Cheryl
Booth, Jeffrey N.
Boothe, Roger and Linda
Border, Jim
Bossmette, Lynne
Boucock, Jerry A.
Bowcutt, Randy and Judy
Bowdish, Dale
Bowe, MartinBoyce, Greg
Brandt, Ronald A.
Brandt, Ruth I.
Bratland, John
Brazier, John
Bredeson, Jack
Bremer, Herman
Brewer, Bill
Bridge, Duane
Brittain, Altheia
Broadsword, Edward D.
Brock, Jim
Brooks, Arlene
Broome, John W.
Broughton, Coral L.
Brown, Barbara K.
Brown, Jack R.
Brown, Laurie Lee
Brown, Phillip G.
Brown, Rick
Brown, Robert J.
Browne, Carolyn
Bryant, R. B.
Buck, Jim
Buckmaster, Sara
Buel, Jr. Joe

Buhman, Charles F.
Bullington, Darryl C.
Bungum, Diane
Bunker, Ken
Bunting, Ray
Burge, Bill
Burkert, Jay and Tami
Burkett, Ruth
Burnett, Ronald E.
Burns, Jere T.
Burns, Michael
Burns, Michael S.
Burr, L. R.
Burril, Deloy L.
Burwell, Harvey H.
Butt, Alan
Butt, Dave
Butterfield, T.R.
Buttram, Lacey
Butzin, Betty Lou
Caffall, Clark
Cain,Rusty
Calica, Charles R.
Calica, Jody
Callister, Larry
Cameron, Geolog. Kenneth A.
Campbell, Cathy
Campbell Don
Campbell, Lois
Cantrell, Mike
Caputo, Janis
Carine, Holly and Amy
Carleson, Dan
Carlile Suzanne J.
Carlson, Dennis
Carlson, Gary
Carlton, Don
Carnes, Jim
Carson, Chuck
Carson, Eloise
Carter, Dr. Lolita
Cash, Larry
Caspar, John
Castell, Lillebil
Cate, James, A.
Cavender, Dick
Chamberlain, Jimmie
Chamberlain, Keith
Chamberlain, Robert L.
Chamberlin, Chuck
Chance, Tom
Chandler, Geoff
Chapin, Stuart
Charles, John A.
Charlton, David
Chase, Craig L.
Cheek
Cheely, Walter H.
Chereck, Jr. Thomas M.
Christensen, John
Christie, John
Ciecko, Director Charles
Clampitt, Maxe
Clare, Bill
Clark, Dennis Lee
Clark, Don
Clark, Larry
Clarke, Frank
Clay, Don
Claymier, Lloyd
Clement, Paul R.
Clements, Rudy
Clemons, Carl M.
Cochran, Floyd
Coffin, David L.
Cohen, Ron
Cohen, Robert S.
Collentine, Mary Ellen
Collins, Tim
Combs, Barbara J.
Conover, Scott
Conrey, William, H.
Cook, T.R.
Coolen, John
Cooper, Clair
Cooper, Larry
Copeland, Jack
Core, John
Coreson, Floyd
Corkran, Char
Corkran, Dave
Couch, John H.
Coulombe, Peggy and James
Countryman, David E.
Courts, Mike
Cox, Benny D.
Cox, Dave
Cox, Fagan A.
Coyle, Ronald
Crabbe, John
Craig, Kenyon
Creager, Jeff, E.
Cree, Shirley
Crenshaw, Claude
Crites, Billy H.
Crites, Robert
Crooks, Doris L.
Cross, Laurie
Crouch, James, W.
Crow, Dennis
Crudele, James
Csuti, Blair
Cullander, Eric
Curtis, Gary J.
Curtiss, Ken
Cynkar, Bob
Dafoe, Vera L.
Dagel, Randy
Dahlke, Laurence
Dalton, Darrell
Dalton, Oliver
Damaskos, Brenda
Daniels, Jim
Daniels, Juanita
Danko, Robert
Dannen, Darrell
Darkis, Ron
Darling, Stephen
Darr, Lori
Dauenhauer, Michael, L.
Davenport, Ted
Davis, Al
Davis, Bertha
Davis, Debra
Davis, Melvin L.
Davis, Ray
Davis, Ray and Phyllis
Davis, Shannon W.
DeBusk, Peter
DeHart, Scott
Decker, Bob
Dee, Lorraine
Deets, John A.
Delacey, W. H.
Deshazer, Loren
Desmond, M. Jack
Dewar, Kenneth R.
Dilsaver, Dr. Larry
Dobson, Robin
Dockham, David
Dodge, Richard
Dodson, Jerold L.
Doggett, Asa D.
Donaghu, William, B.
Donahue, Bill
Donnelly, Mae b.
Donnelly, Michael
Donsback, Ex. D. Margaret
Dooley, Joe L.

Dooley, Sheila
Drake, Franklin G.
Draper, Corey
Drew, Randy
Dryad, Anne
Duckwall, Richard F.
Duddles, Robert C.
Dufault, Art W.
Dunnavant, Georgeanne
Durham, Rita
Durham, Tommy Q.
Durrell, M. W.
Duvall, Jr. Clyde H.
Dye, James and Jana
Dyke, Eleanor T.
Earl, Gary
Edgerley, W.
Edmunds, Dean C.
Edwards, Glen
Egger, Mark
Ehinger, Mr. Paul F.
Eichner, Keith L.
Eixueberger, Don
Ek, David
Elicker, Roy
Elies, Ray
Ellett, Virgil
Elsner, Ronald L.
Emmer, Tom
Endow, Sho
Eng, Helge
Engelen, Hal
Erdman, Dr. Kimball
Ervin, Dennis and Mary
Etheridge, Joseph E.
Evans, Ron
Evans, Zuella J.
Faas, Robert L.
Fahey, Michael
Faircloth, William
Fallon, Dale
Farmer, Lester C.
Faurot, Tom
Felix, Duane F.
Ferguson, Floyd D.
Fertuson, John F.
Ferrell, Steve
Finnell, Jack
Fitzpatrick, Francine
Flann, Nicholas
Fleming, John L.
Flint, Robert
Flood, Patrick
Flory, Perry
Flynn, Brian
Foglio, Jim
Forbes, Herb
Ford, D. Annie
Ford, Nancy H.
Fortune, Frances M
Fortune, Glenn D.
Forvilly, Lorraine
Foster, Bruce A.
Fox, Barbara
Fox, Lynn E.
Frank, Martin J.
Franke, Randy
Fredsall, R. M.
Freeman, Richard W.
French, Jr. Chester W.
Freres, Rob
Friberg, Jack R.
Frimark, Bob
Frohwerk, Ralph
Frost, William J.
Fultz, Earl
Fuman, Gary L.
Funk, Floyd
Funk, Terry L.
Furlow, Philip
Gabel, Lawrence
Gabriel, Bill
Gabrielsen, Helen M.
Galasso, Robert
Gall, Thomas L.
Galloway, Jr. Kenneth
Galyen, Frank E.
Gantner, Rudolf
Gardner, Len
Gardner, Robert L.
Garner, Frank L.
Garrett, Roger C.
Garrison, Stephen H.
Gaskins, W.
Gauvin, Leo
Gay, Peter and Kathy
Gaynor, Phoebe H.
Gearhart, Clarence
Gearhart, Frank
Gehrig, Rudy F.
Gehrke, Eric
Geisinger, James, C.
Geller, Cascade Anderson
George, Rick
Gerl, Bob
Gerl, Garyf
Gholston, Willis
Gianopoulos, N.
Gibbons, Karen and Rick
Gibbs, Russ
Gibson, Bus
Gilbert, Russell V.
Gildea, John
Girouard, M. R.
Girrens, Edward M.
Gleason, Sah
Godfrey, Alma
Godfrey, Louise
Goede, Keith
Goldberg, M.D. Marshall
Golder J. R.
Goldy, Daniel L.
Gonzalez, Reynaldo
Goode, Ken
Goodwin, Ron
Gootee, Herbert R.
Gorason, Eric
Gorbett, Emery
Gorbett, Preston
Gorman, John
Goudy, Alan C.
Gould, Randy
Graham, Michael D.
Grate, Donald A.
Gray, Kenneth D.
Gray, Robert
Green, Bob
Greenstreet, Michael
Gregg, James M.
Gregg, Philo
Gregory, Michael L.
Gregory, Thomas L.
Gries, James P.
Griffith, E. K.
Griffith, John
Griffith, Nigel
Griffwood, H.
Grim, Don
Grimm, John
Gross, Jack
Grote, Richard
Grove, Gary and She
Gruetzke, Jim
Guard, Jeff
Geurds, Bill
Guest, Richard H.
Guffy, William
Gula, Paul
Gustafson, Carl W.

Gustafson, Richard
Haake, Carla
Haddon, Rob and Mo
Hadley, J. D.
Hagemeister, Kermit
Haglan Mr. and Mrs. Wm. C.
Haglund, Herb
Haglund, John Charles
Hall, Christina
Hall, David E.
Hall, Ed
Hallgarth, Jane
Hamada, Menoru
Hamilton, Walter Jay
Hammer, Bill
Hammond, John
Hanby, John E.
Hancock, Jim
Handler, Elizabeth
Hanel, L. Sterlin
Hanel, Robert L.
Hanel, William W.
Haner, Ronald R.
Hanna, Kirk O.
Hanna, Richard
Hannum, Jeff
Hansbergen, Ted
Hansen, Betty Q.
Hansen, Goron Neal
Hansen, Harold
Hanson, L.I.
Haram, Jerry
Harmon, Jean
Harris, Glenda
Harris, Mrs. Edwards
Harris, William
Harrison, Charles R.
Harrison, Richard
Harte, Janet
Hartline, Jane
Harvey, Dr. Ralph
Hauptmann, Mr. David
Havlicek, Martin
Hawkins, Carleen
Hayden, D.M.D. Cedric L.
Hayward, Dennis
Heath, C. W.
Heileson, Steve
Heissenbuhel, Anne E.
Helm, Mike
Helmig, Don
Henderson, George
Henderson, Robin
Henrikam, Gerald
Henson, Michael C.
Hepburn, Eldon E.
Hepner, Rosalea
Herbers, Helen
Herbert, Mel
Herbert, P. Sydney
Herman, Bob
Herman, Don
Herman, Sharon
Herrick, Danny D.
Herring, Lynn
Hertrich, Adolph
Herzfeld, Dave
Hess, Phil
Hechtel, Tom
Heuker, Bernie
Hicks, Wallace
Hiebert, Edwin
Higginson, Mark
Hilbruner, Michel
Hill, Maryanne
Hinkley, Rick
Hinman, Bob
Hinton, Joseph
Hitchcock, H.D.M. Ray
Hodgin, Daniel L.
Hoff, Donald
Hoffman, Ron
Hoffman, Thomas L.
Hohnstein, Gary
Holliday, Ron and Sherry
Holliday, Mayor Sherry
Holmes, Thomas A.
Holmes, Willa Bee
Holscher, Ron
Hook, Director David L.
Horrax, David
Horton, Michael L.
Horzella, Theodore I.
Hosford, Leslie
Hosler, Tom
Hotka, Ray
Howard, Doug
Howard, Earl E.
Howard, Robin
Howe, Daniel
Hoyt, Daryl Thie
Hubbands, Emily R.
Hubert, William H.
Hudetz, Lawrence
Huff, Betty Jo
Hughes, Gwen M.
Hughes, Chloe and Joe
Huiras, Roger
Hukari, Brian
Hukari, Rob
Hull, Ruby B.
Hull, Sharon M.
Humphrey, Cathy
Humphrey, Lon
Hunt, James
Huntington, Dave
Huntington, Susan
Hurst, Jim
Husby, Jr. Hendrick L.
Huskey, Larry D.
Huston, Dennis R.
Hutton, Patricia
Illingworth, Wayne
Inman, Dennis
Ivanhoe, Dave
Ivanoff, Dave
Jabs, Paul L.
Jacobsen, Kimberly
Jacobsen, Kim
James, George I.
Jameson, Sondra
Jensen, Carol
Jensen, Judy
Jeppesen, J. H.
Jessee, Wade L.
Johnson, Brandy
Johnson, Ida
Johnson, Jim
Johnson, John A.
Johnson, Marvin
Johnson, Norm
Johnson, R.D.
Johnson, Richard L.
Johnson, R. M.
Johnston, V. W. Monty
Jolley, Russ
Jonasson, Brian
Jondahl, Terry
Jones, Brenda
Jones, Chet C.
Jones, Daniel
Jones, Darrel
Jones, Greg
Jones, John L.
Jones, Larry D.
Jones, Michael S.
John Mr. and Mrs. A.
Jones, Robert
Jones, Steve

Joslyn, Donald L.
Juras, Michael
Kaeder, M.D. Collin Sco
Kahn, Gary K.
Kaiser, Geoffrey, W.
Kaley, Rita
Kane, Van R.
Kanne, James, A.
Karamanos, B. Lou
Karp, James D.
Katehia, Cy
Kauppila, James R.
Keil, Bill
Keillor, Cecil e.
Keller, Blane
Kelly, Glenn L.
Kelly, Kent S.
Kelly, Joseph D.
Kenaston, Ken
Kennedy, President John
Kenoyer, Helen M.
Kent, Charles A.
Kenworthy, Melvin W.
Kephart, Al
Kephart, Owen
Kerr, Andy
Kerr, Shirlee
Kessler, Kurt
Keyser, Wm. R.
Kibbey, Tohren
Kiggins, Leslie C.
Killingsworth, Monte
Kincaid, Jefferson
King, Melissa S.
Kingsley, Margie
Kinnaman, Anne
Kintigh, Senator Bob
Kirby, Ralph
Kirchmeier, S. E.
Kirnak, Alex
Klapprich, Nick
Klassen, Art
Klawitter, Rod
Kleinberg, Kark and Ingrid
Klock, Claire
Kloos, Jeannette
Kloster, Tom
Klundt, Authur L.
Knapp, Joan K.
Knight, Jeff
Knutsen, Richard J.
Kober, Larry
Kocher, Chuck
Kohnstamm, Dick
Koos, George
Kraxberger, Duane
Kraxberger, Walter S.
Krefft, Kevin P.
Kremers, Kurt S.
Krohn, Robert F.
Krupicka, Joseph
Krupicka, Penny
Kruse, David H.
Kurssow, John
Kupillas, Edgar A.
Kurtz, Gary
Kurtz, Winston W.
Kusachi, Fred
Kuschke, Albert F.
Kuykendall, Keli
Laakso, Harri
Lafferty, Michael
LaFontaine, Lee and Susan
Lahey, Eleanor H.
Laird, Kenneth L.
Laird, Pam
Lake, Charles
Lamont, Ralph
Landquist, Eric
Langtry, Judge and Mrs. S.
Lantz, Valeria
Laster, Jeffrey L.
Laughlin, Frank A.
Laughlin, Roland
Lawson, John
Lawton, Joseph
Lay, Lois
Layton, Leroy
LeBrun, Jimmy A.
Leachman, Charles, D.
Lee, F. Duane
Lee Harold J.
Lee, Robert
Lee Shirley S.
Leeson, Le Roy
Leever, Dick
Leffel, John
Legg, Charles
Lehmer, Louis
Lehto, Layton R.
Leiblein, Loren K.
Leblein, Susan
Lemaster, J. A.
Lenhardt, Jr. Floyd
Lenon, William
Lepin, J.R.
Lettenmaier, Ed
Leupold, Jr. Norbert
Levin, Elinor A.
Lewis, Dennis
Lewis, Mrs. Lynda
Lewis, Reg. Sup. Stephen L.
Lieurance, Robert E.
Lindsay, Angus M.
Linell, Thomas
Litt, Michael
Littlewood, Ann
Liverman, Marc
Long, Don
Long, Meridith
Long, Wm. H.
Loppnow, Bettie M.
Lottridge, Helen
Love, Ken and Ruth
Lovely, Elizabeth
Ludeman, Wayne
Lundblad, Rob
Luthy, Mr. Raymond
Lynn, George W.
Lysek, Carol Ann
Maben, Lorna
Mack, Suzanna
Mackinnon, Douglas A.
Magin, Dave
Mahoney, Mike and Eva
Mainwaring, Ray
Mallon, James
Manion, Peter
Mannchen, Brandt
Mansfield, Mike
Maples, Don
Marchand, Mike
Marsh, Norman T.
Marshall, Betty
Marshall, Ned
Marshall, W. R.
Martin, Dale
Martin, Jerry
Martin, Kenneth D.
Martin, Richard L.
Martinez, Ed
Mason, Judy and George
Mason, Denver
Mason, Mary B.
Massey, Jay
Matejko, Ann
Mathes, Jackie M.
Mathews, Daniel W.
Maulding, Vern

Maurer, Doug
Maxam, Glenn and Marsha
Maxwell, David
May, Patrick W. F.
Mayer, Julie
Mayer, Tim
Mayhew, Dona
McArthur, Lewis L.
McBain, Robert A.
McBee, Ph. D. Richard H.
McCabe, John
McCallum, Bob
McCann, E.
McCann, Kathleen
McCargar, Dean
McCarthy, Gerald S.
McCarthy, J.
McCarthy, Kate
McCarty, Alair
McCauley, James
McClintock, R. J.
McConell, David
McDermaid, Sharon
McDermott, Pat
McDonald, Julie
McElheran, Marshall
McGinnis, Charles I.
McGraw, Eunice
McGuire, Tim
McGuire, Tom
McKendrick, John
McManama, Charles, E.
McManos, Bill
McNeill, Gerald
McTeague, Dave
Meadows, James
Meak, Keith G.
Meehan, Tom
Meek, John Robert
Mehns, Dr. and Mrs.
Meigs, Gilbert
Melloway, Robert C.
Melvin, Day B.
Menicosy, David E.
Merchen, W. R.
Merlich, Max
Merlich, Wilbur and M.
Merrick, Tom
Merz, Robert
Meyer, David B.
Meyer, William H.
Meyercierk, Hal
Meyers, Dennis
Meyers, Merton fE.
Meyers, Ronald
Michola, Daniel
Mill, Roland
Miller, A.W.
Miller, Bobbie
Miller, David
Miller, Gregory A.
Miller, Joseph L.
Miller, Linda
Miller, Loren
Miller, Mike
Miller, Richard
Miller, Robert E.
Miller, Roy L.
Miller, Susan
Miller, Wayne
Mills, Richard M.
Miner, Jim
Mintkeski, P.E. Walter C.
Mitchell, Eileen
Mitchell, John
Mitten, Herman C.
Moe, Winifred
Mohla, Dave
Monett, David r.
Montgomery, Robert L.
Moon, Dale L.
Moore, Allen E.
Moore, Audrey
Moore, Frank
Moore, Larry
Moore, Lola
Moore, Troy
Morby, Jack J.
Morgan, John
Morgan, John C.
Morin, Claude and Betty
Morris, Nadine
Morris, Peter B.
Morrison, Wilton
Mortinson, Tom
Morton, Rex C.
Moss, Kerry
Mudd, Richard
Mueller, Gunther
Mullins, Jim
Munro, Glenn
Murk, Quinn J.
Myers, Karen
Myron, Jim and Kathi
Nagler, Michael
Nash, Thomas K.
Nastasi, Constance
Naylor, Dwight
Naylor, Stan K.
Neal, Noel W.
Needham, Vicki
Nelson, David A.
Nelson, Mayor Thomas
Neville, Director Eric Jagger
Neville, Manager Clarence
Newcomb, Elizabeth
Newman, Don
Newport, Carl
Newton, Jim
Newton, Jr. Kenneth
Newton, Steve
Nicholson, Charles
Niece, Dr. W. K.
Niss, Bruce
Noble, Eva L.
Noland, Thomas L.
Norseth, Palmer
Norton, Robert G.
Novak, Chester
Nunez
Nye, James A.
O'Hara, Gerald
O'Neill, John
O'Neill, Robert
O'Riordan, Esq. W. Hugh
Obrien, John
Oft, Elizabeth
Odgen, Tony
Ohta, Keith and Li
Oldfield, H. P.
Olsen, Jim
Olsen, Richard
Olson, Ted M.
O'Neil, John
Orman, Andrew
Ossowski, Steve and Gale
Otis, E. Florence
Otto, Marion
Owen, Jim
Pahn, Andy and Melissa
Park, Ed
Parker, Dorothy
Parkhurst, Tery
Parman, Sidney
Parrett, James E.
Parrish, Clifton, M.
Parsons, Gregory
Patera, Alan H.
Pattersen, Don

Patterson, George
Patton, Darrel M.
Paulsen, Paul C.
Paulus, Norma
Payne, Nancy
Paynter, Gaylon L.
Peebles, Robert J.
Penas, John H.
Pendleton, Dorotha
Perkins, Lyle C.
Person, Richard A.
Peterkin, Jena
Peterson, Clinton M.
Peterson, Don
Peterson, Gerald
Peterson, Mark S.
Peterson, Ray
Petrie, Keith
Pettijohn, N.W.
Pex, David
Peyran, R. P.
Phelps, J. L. and Mary H.
Phillips, Hazel
Phillips, Ray
Pickering, Ed
Pierson, Richard
Pobanz, Aileen
Pogue, Todd
Polach, Daniel R.
Polack, Donald H.
Poland, Rick
Polityka, Charles S.
Ponichtera, Kenneth, c.
Pooley, Richard R.
Pope, Dennis B.
Pope, Richard G.
Porter, James D.
Posekany, Dick
Posekany, Rick
Potter, Ben
Potter, John R.
Potts, Harry
Powell, Francis
Powell, J. W.
Powne, Bob
Price, Allyn M.
Price, Gordon
Pringle, Patrick
Pringle, Tom
Prock, Steve
Puckett, Jim and Patty
Puhlman, Roy D.
Pular, Clayton E.
Putnam, Gordon J.
Quagliani, Joseph G.
Qualey, Norman
Qualey, Scott
Questad, Louise
Quint, Don C. and J.
Radetich, Dave
Raebeck, Mayor Moe
Ragan, Pat
Rake, Fred E.
Ramm, LeRoy L.
Ramsey, John C.
Rand, John
Raney, Barbara J.
Raney, By
Rasmussen, Mark
Ratcliffe, Bob
Ratcliffe, Bob
Rathbone, Nate
Rayburn, John W.
Read, Larry
Recht, Fran
Reddekopp, D.
Redfern, Roger A.
Reed, Margaret M.
Reed, Steve
Reeves, Jon M.
Rehm, R. S.
Reins, Jeff W.
Reisch, Dixie M.
Rhodes, Frank and Jane
Rhods, Everett G.
Rice, Martha
Richards, Alfred W.
Richen, Clarence
Rickard, Dan
Ring, Dick
Roark, Sam
Roberts, Billy N.
Roberts, Royce
Roberts, Sharon C.
Robertson, Lance
Robinson, Bob
Robinson, William Matthew
Rodgers, Robert
Rodriguez, Frank
Roessner, Gary
Rofsky, R.
Rogers, George O.
Rogerson, Neil
Rohrbaugh, Paula
Rombach, Jim
Rondthaler, Howard M.
Root, Barbi L.
Rosemont, R. K.
Rosenbaum, Ken
Rosenfeld, Alan
Rothman, Bruce J.
Rowell, Ted
Running, Leif
Rushmeier, Larry
Russell, Joe A.
Russell, Robert S.
Rutherford, Ken
Ryland, Arnold
Rynearson, Gary
Saathoff, Tom
Salka, Don
Saltzman, Dan
Sampson, David
Sandoval, Michael
Sandoz, Carl and Winifred
Sandoz, Ron
Saperstein, Ralph
Saunders, Bob
Scanlon, Thomas L.
Schafer, Warren
Schalk, Tim
Schauer, Diane
Scheller, James
Schenewark, Barbara
Schiedler, Charles A.
Schiltheres, Beverly
Schneider, Curt
Schott, Joseph C.
Schramm, Richard
Schroeder, Kirk
Schroeder, Norman
Schuetz, Dick
Schuster, Daniel
Schwanke, Howard
Schwartz, Wayne
Scott, Mr. and Mrs C. T.
Scranton, Lee R.
Sefler, William E.
Seymore, Jack
Seymour, Sally
Shalhope, Don
Sharkey, Doug
Sharp, Grant I.
Sharp, Lynn
Shaw, Charles M.
Shea, Phyllis
Shephard, George R.
Shepherd, Roger
Sherrerd, Jay

Sherrill, Michael
Shiels, A.I.A. Roger
Shiolas, Tom
Shiprade, Bob
Shoeppert, Ray
Sholl, Maurice C.
Showerman, David
Shroll, Dick
Shumaker, Terence
Shumway, T.
Shurgot, Michael W.
Siddall, Jean
Silbernatel, Cliff
Simila, Kendrick J.
Simmons, Jim
Simmons, Roy M.
Simon, Clay R.
Sinclair, Jeanne L.
Singleton, Barbara
Sinop, Shawna
Sisson, Cotton
Sitkei, Dr. E. George
Sitzman, James
Skou, Jean A.
Skov, Lucia N.
Slagle, Kevin
Slaughter, David
Sloan, Daniel
Smith, Al
Smith, Catherine
Smith, Charles A.
Smith, Donald L.
Smith, Fred
Smith, Joie
Smith, Laurie
Smith, Leonard H.
Smith, Mary
Smith, Milt
Smith, Vince
Smith, Wesley J.
Smothers, Donald P.
Snell, Lawrence A.
Snodgrass, Russell J.
Somboonsiri, Charn
Sorger, Joey L.
Southard, Judy
Spanier, Sandra
Spath, Dennis
Spence, Marcia
Spiering, Jean M.
Springfield, Rick
St. Clair, Frank W.
Stahl, Andy
Stairs, Bill
Stangel, David
Stangell, Julie M.
Stanton, Jules
Stanton, Lee
Stariha, Charles
Starke, Gretchen
Steele, William K.
Steeves, Brian K.
Steffon, Randall
Steiner, Tom
Steinkamp, Doug
Stellflug, Frank
Stenberg, Brian
Stenerson, Janet
Stenerson, Roger
Stenger, Gilbert
Stensrud, Chuck
Stere, David
Stevens, Dolores D.
Stillwell, W. L.
Stipak, Brian
Stockman, Bonnie
Stolaas, Tom
Stone, Jack
Stout, Douglas E.
Strawn, Chris
Stuemke, Scott E.
Sutton, Keith
Svart, Larry
Swanson, John R.
Sweeney, A. P.
Sweeney, Michael J.
Sweider, Sue
Swift, Arthur
Swift, Clinton
Swigart, Ehvin H.
Swire, Mrs. B. Melvin
Tauscher, Stan
Taylor, Jimmy D.
Taylor, William J.
Teckenburg, Rodney J.
Temminger, Randy L.
Tesch, Fred
Thiel, Michael
Thimmesch, Vicky
Thomas, Carolyn
Thomas, Francis S.
Thomas, Frank and Phyllis
Thompson, Dalton A.
Thompson, Danny
Thompson, D. Olcott
Thomsen, A. M.
Thorton, Jr. C. W.
Thornton, Richard J.
Throop, Douglas A.
Tindall, Benell
Tobkin, Janet E.
Toll, Larry
Tolle, Timothy
Tomjack, T. J.
Torrance, Glen
Torsen, Patricia
Tout, Debra
Townsend, Harold F.
Tregarth, Surra
Troutman, Albert
Troxel, Ed
Tubbs, Nick
Tufts, James E.
Tull, Jr. Lawrence P.
Turner, Joan M.
Turner, Laurie
Turrell, Susan
Tuttle, Larry
Tylman, Kent
Udy, Jamie
Ulbright, Larry
Ulmer, David J.
Urban, Leslie G.
Urban, Lorne
Urban, Lorne G.
Utley, Wayne
Valo, Ellisa
Valpy, E. B.
Vamtyne, Douglas
VanBlokland, Mick
VanCleave, Dale E.
VanEpps, Charles P.
VanOrman, Gary R.
VanOsdol, R. L.
VanOver, Larry
VanVranken, Steven R.
Vanden Bos. Rick A.
Vander Schaaf, Dick
Vann, Gary
Vantzelfden, Wesley W.
Varney, Wesley E.
Veele, Carol A.
Veele, Emil
Velene, Virgil E.
Visser, Larry R.
Vogel, Bill
Vogt, Franklyn C.
VonLubken, Joann
Vorderstrasse, Donald

Vuylsteke, Keith
Waddel, Jr. William S.
Wagenman, Christian
Wagner, M. B.
Wagner, Pete
Wakefield, Rex W.
Waldron, Rex
Walezak, Peter
Walicki, Joe
Walker, Brent C.
Walker, D. D.
Wallace, Ken
Wallace, Kirk
Walsh, Tom
Walters, Lenore
Wapato, S. Timothy
Ward, George
Ward, Jay
Ward, Mike W.
Warner, Mary
Warren, Charlie
Warren, Keith
Warren, Rena
Webb, Gary
Webb, Jacob D.
Webb, Michelle E.
Weber, Dennis
Weber, Virginia
Weiers, Sr. Harry L.
Weinreich, Bob
Weiss, David
Weitman, Rick S.
Wells, Judy
Welter, Bill
Wendolowski, Skip
Wertgen, Bernie
Weseman, Charles E.
Westgate, John and Martha
Wigg, Mark
Whitecotton, Randy
Whitecotton, Roger
Whitney, Matthew
Whitney, Peter
Wiidanen, Neil
Wild, David W.
Wilds, Gladys
Wilds, Richard T.
Wilkinson, Mr.
Williams, Chuck
Williams, James D.
Williams, Robert
Willis, Rob
Wilson, Brad
Wilson, Douglas Neil
Wilson, John C.
Wilson, Loverna
Wilson, Mark S.
Wilson, Paul
Wilson, Roy
Wiltz, John R.
Winner, Dennis
Winnett, Craig
Wittemyer, George
Witter, Donald
Witter, R. L.
Wittrock, Arnold
Wolf, Reinhard
Wolf, Rip Lone
Wolf, Reinhard
Wonsyld, John W.
Wood, J. M. and E. C.
Wood, Karen
Woods, Ron
Worley, Kathleen
Worsham, Carolyn H.
Wrabsk, J. T.
Wright, Ron and Kim
Wright, William H.
Wylie, Todd
Wyss, Geo. W.
Yasui, Tom
Yates, Jack C.
Yett, Mr. and Mrs. Ben
Yoon, Leonard
Yost, Wallace H.
Youker, Claude W.
Youmans, Jack W.
Youmans, Jack
Young, Katherine
Young, Ruth H.
Younger, Nancy R.
Zacher, Bonnie M.
Zamperin, Angelo
Zander, Larry M.
Zeller, Clyde
Zengel, Tom,
Ziegenbein, Lester, E.
Zimmer, Ed
Zuck, Robert D.
Zwaneveid, Pete

Glossary

Glossary

A

Acre Equivalent

When applied to habitat improvement or improvement structures this term reflects overall habitat benefits derived. It reflects the zone of influence of the habitat improvement for the target species. For example, a single water development for upland game birds occupies very little space but has an acre equivalent of 160 because it serves 160 acres of bird habitat. A single water structure for big game has a value of 640 because it has a larger zone of influence for the more mobile big-game animals.

Acre-Foot (AF)

A water measurement term equal to the amount of water that would cover an area of one acre to a depth of one foot (43,560 cubic feet).

Activity

Actions, measures, or treatments that are undertaken that directly or indirectly produce, enhance, or maintain forest outputs and rangeland outputs, or achieve administrative and environmental quality objectives. Forest Service activity definitions, codes, and units of measure are contained in the Management Information Handbook (FSM 1309.11).

Air Quality Related Values (AQRV)

Those features or properties of a Class I area that made the area worthy of designation as a wilderness and that would or could be adversely affected by air pollution. Any physical, chemical, or biological component of an ecosystem that can be affected by changes in air pollutant levels. As an example: visual range as measured from a vista may be shortened by the presence of fine particulates in the air. Similarly a threatened or endangered plant species may be sensitive to sulphur dioxide levels.

Airshed

A geographical area that, because of topography, meteorology, and climate, shares the same air.

Allocated Funds

Funds from sources other than Congressionally appropriated funds. Allocated funds include the Senior Community Service Program (H04), brush disposal (BD), Knutson-Vandenberg cooperative deposits (K-V).

Allowable Sale Quantity

The quantity of timber that may be sold from the area of land covered by the Forest Plan for a time period specified by the plan. This quantity is usually expressed on an annual basis as the average annual allowable sale quantity. (The allowable sale quantity applies only to the lands determined to be suitable for timber production, and to the utilization standards specified in the land and resource management plan.)

Alternative

One of several policies, plans, or projects proposed for decision making.

Analysis Area

The fundamental unit of land required by the Forest Planning Optimization Model (FORPLAN). Delineators include land and location characteristics of importance to the Planning Questions which cause significant differences in quantifiable items (yields, costs, benefits) pertaining to the conditions.

Amenity

An object, feature, quality, or experience that gives pleasure or is pleasing to the mind or senses. Amenity value is typically used in land use planning to describe those resource properties for which market values (or proxy values) are not or cannot be established.

AMS

An abbreviation of Analysis of the Management Situation.

Anadromous Fish

Those species of fish that mature in sea and migrate into streams to spawn. Salmon, steelhead, and shad are examples.

Analysis Area

A delineated area of land subject to analysis of (1) responses to proposed management practices in the production, enhancement, or maintenance of forest and rangeland outputs and environmental quality objectives and (2) economic and social impacts.

Analysis of the Management Situation

A determination of the ability of the planning area to supply goods and services in response to society's demand for those goods and services.

Animal Unit Month (AUM)

The quantity of forage required by one mature cow (1,000 pounds), or the equivalent for one month, based upon average daily forage consumption of 26 pounds of dry matter per day (800 pounds/month).

Appropriate Suppression Response

The planned strategy for suppression action (in terms of Kind, amount, and timing) on a wildfire which most efficiently meets fire management direction under current and expected burning conditions. It may range in objective from prompt control to one of containment or confinement.

Appropriated Funds

Funds from the U. S. Treasury, which Congress has authorized the Forest Service to obligate. This is the sum of operational, capital investment, and backlog costs.

Aquatic Ecosystems

Stream channels, lakes, marshes or ponds, etc., and the plant and animal communities they support.

Aquatic Habitat

Habitat directly related to water.

Aquifer

A geologic formation or structure that contains and transmits water in sufficient quantity to supply the needs for water development. Aquifers are usually saturated sands, gravel, or fractured rock, etc.

Arterial Roads

See Roads.

Assessment

The Forest and Rangeland Renewable Resource Assessment required by RPA.

AUMs

An abbreviation of Animal Unit Months.

B

Background

The visible terrain beyond the foreground and middleground where individual trees are not visible but are blended into the total fabric of the forest stand (see Foreground and Middleground).

Basal Area

The cross-sectional area of a stand of trees measured at breast height. The area is expressed in square feet.

Base Sale Schedule

A Timber Sale Schedule formulated on the basis that the quantity of timber planned for sale and harvest for any future decade is equal to or greater than the planned sale and harvest for the preceding decade, and this planned sale and harvest for any decade is not greater than long-term sustained yield capacity. (36 CFR 219.3).

Benchmark Levels

The outputs and costs for managing the Forest at certain levels of management so that a comparison could be made on costs, values, and effects.

Benefit

The results of a proposed activity, program or project expressed in monetary or nonmonetary terms.

Benefit-Cost Ratio

Measure of economic efficiency computed by dividing total discounted primary benefits by total discounted economic costs.

Best Management Practices (BMP)

A practice or combination of practices that are the most effective and practical (including technological, economic and institutional considerations) means of preventing or reducing the amount of pollution generated by non-point sources to a level compatible with water quality goals.

Big Game

Those species of large mammals normally managed for sport hunting.

Biological Growth Potential

The average net growth attainable in a fully stocked natural forest stand. (36 CFR 2193)

Biological Potential

The maximum amount of sustainable wood fiber obtainable by application of intensive management (timber) practices to acres classified as commercial forest land. The needs of other forest uses are not incorporated.

Biological Control

Biological control is the use of parasites, predators, or disease pathogens (bacteria, fungi, viruses, and others) to suppress pest populations.

Biomass

The total quantity (at a given time) of living organisms of one or more species per unit of space (species biomass), or the total quantity of all the species in a biotic community (community biomass).

Boulder-Rubble Streams

Streams that are characterized by boulder (greater than 1 foot in diameter) and rubble (6 to 12 inches in diameter) bottoms.

British Thermal Unit (BTU)

The amount of heat required to raise the temperature of one pound of water one degree Fahrenheit.

Broadcast Burn

Allowing a prescribed fire to burn over a designated area within well-defined boundaries for a reduction of fuel hazard or as a silvicultural treatment, or both.

Brush

A growth of shrubs or small trees usually of a type undesirable to livestock or timber management.

BTU

An abbreviation of British Thermal Unit.

C

Calibration

The process of predicting modeled fire sizes and fire intensity levels for each Fire Management Analysis Zone. The process uses historical occurrence and burned acreage to accurately reflect the "real world." Adjustments are based on modeling the current fire organization (1978) against historical fire occurrence (1970-1979) using the same dispatch of fire fighting forces philosophy and suppression strategies.

Capability

The potential of an area of land to produce resources, supply goods and services, and allow resource uses under an assumed set of management practices at a given level of management intensity. Capability depends upon current conditions and site conditions such as climate, slope, landform, soils and geology, as well as the application of management practices, such as silviculture or protection from fire, insects, and disease. (36 CFR 219.3)

Categorical Exclusion

A decision to exclude an action from the need to document the environmental analysis in an Environmental Assessment or EIS. It is based on the responsible official finding that the action will have no significant effect on the human environment, individually or cumulatively. If there is any uncertainty regarding effects; appropriate documentation of the analysis is required.

CEQ

Council on Environmental Quality.

Chargeable Timber Volume

Timber removed from regulated forest land that contributes to the allowable sale quantity.

Chemical Control

A method to control insect populations or tree disease through the use of applied chemicals.

Class I Wilderness

Those wilderness over 5,000 acres which were in existence as of August 7, 1977. All other National Forest System lands are Class II, including new wildernesses and expansions to Class I wildernesses which occurred after August 7, 1977.

Clearcutting

The harvesting in one cut of all trees in an area for the purpose of creating a new, even-aged stand. The area harvested may be a patch, stand, or strip large enough to be mapped or recorded as a separate age class in planning for sustained yield.

Climax

The culminating stage in plant succession for a given site where the vegetation has reached a highly stable condition.

Climax Species

Those species that dominate the forest stand in either numbers per unit area or biomass at climax.

Code of Federal Regulations (CFR)

The listing of various regulations pertaining to management and administration of the National Forest.

Collector Road System

See Roads.

Commercial Forest Land (CFL)

Land that is producing, or is capable of producing, crops of industrial wood and (1) has not been withdrawn by Congress, the Secretary of Agriculture, or the Chief of the Forest Service; (2) land where existing technology and knowledge is available to ensure timber production without irreversible damage to soil productivity or watershed conditions; and (3) land where existing technology and knowledge, as reflected in current research and experience, provides reasonable assurance that adequate restocking can be obtained within 5 years after final harvesting.

Commercial Thinning

Any type of tree thinning that produces merchantable material at least equal in value to the direct costs of harvesting.

Commodity

A transportable resource product with commercial value; all resource products which are articles of commerce.

Common Varieties

Nonmineralized sand, gravel, stone, etc. (See Mineral Materials.)

Community Stability

A community's capacity to handle change without major hardships or disruptions to component groups or institutions. Measurement of community stability requires identification of the type and rate of proposed change and an assessment of the community's capacity to accommodate that level of change.

Concern

A point, matter, or question raised by management that must be addressed in the planning process.

Confine

To restrict the fire spread within a predetermined area principally by use of natural or preconstructed barriers or environmental conditions. Suppression action may be minimal and limited to surveillance under appropriate conditions.

Congressionally Classified and Designated Areas

Areas that require Congressional enactment for their establishment, such as National Wilderness

Areas, National Wild and Scenic Rivers, and National Recreation Areas.

Conifer

A group of cone-bearing trees, mostly evergreen, such as pine, spruce, fir, etc.

Consumptive Use

Those uses of a resource that reduce its supply.

Contain

To surround a fire, and any spot fires therefrom, with control line, as needed, which can reasonably be expected to check the fire's spread under prevailing and predicted conditions. The normal suppression tactic is indirect attack, allowing the fire to burn to human-made or natural barrier with little or no mop-up.

Control

To complete the control line around a fire and around any spot fires therefrom and any interior islands of vegetation to be saved. Firefighters will also burn out any unburned area adjacent to the fire side of the control line, and cool down all hot spots that are immediate threats to the control line until the line can reasonably be expected to hold under foreseeable conditions. The normal tactic is direct attack on the fire, if possible, and mop-up to extinguish all fire.

Core Area

(As related to spotted owl.) An area encompassing at least 300 contiguous acres of old growth forest suitable for nesting and reproduction. The area consists of a portion of the territory required by a pair of owls, the nest site, and principal roost areas.

Corridor

A linear strip of land identified for the present or future location of transportation or utility rights-of-way. (36 CFR 219.3)

Cost Efficiency

The usefulness of specified inputs (costs) to produce specified outputs (benefits). In measuring cost efficiency, some outputs, including environmental, economic, or social impacts, are not assigned monetary values but are achieved at specified levels in the least cost manner. Cost efficiency is usually measured using present net value, although use of benefit-cost ratios and rates of return may be appropriate. (36 CFR 219.3)

Cost, Capital Investment

The cost of man made structures, facilities, or improvements in natural resources used as inputs in production processes to produce outputs over one or more planning periods.

Cost-Effective

Achieving specified outputs or objectives under given conditions for the least cost.

Cost, Fixed

A cost that is committed for the time horizon of planning or the decision being considered. Fixed costs include fixed ownership requirements, fixed protection, short-term maintenance and long-term planning and inventory costs.

Cost, Operational

Costs associated with administering and maintaining National Forest facilities and resource programs. This includes appropriated funds only.

Cost, Variable

A cost that varies with the level of controlled outputs in the time horizon covered by the planning period or decisions being considered.

Council on Environmental Quality (CEQ)

An advisory council to the President established by the National Environmental Policy Act of 1969. It reviews Federal programs for their effect on the environment, conducts environmental studies, and advises the President on environmental matters.

Created Opening

Created openings are openings in the Forest created by the silvicultural practices of shelterwood regeneration cutting at the final harvest, clearcutting, seed tree cutting, or group selection cutting.

Critical Habitat

For threatened or endangered species, the specific areas within the geographical area occupied by the species (at the time it is listed, in accordance with provisions of Section 4 of the Endangered Species Act) on which are found those physical or biological features essential to the conservation of the species. This habitat may require special management considerations or protecting. Protection may also be required for additional habitat areas outside the geographical area occupied by the species at the time it is listed based upon a determination of the Secretary of the Interior that such areas are essential for the conservation of the species.

Critical Minerals

Minerals essential to the national defense, but whose procurement, while difficult in case of war, is less serious than those of Strategic Minerals.

Critical Window

A control point or area (such as a mountain pass) not included in an existing utility corridor but needed to retain future new utility corridor options.

Cubic Foot

A unit of measure with the dimensions of one foot x one foot x one foot.

Cull Tree

Trees of commercial species or commercial species of any size which are not now or/and will never be expected to contain more than 20% sound cubic feet of volume because of damage or defect.

Culmination of Mean Annual Increment (CMAI)

The point where the mean annual growth of a timber stand ceases to increase prior to decline. This is calculated by determining the cubic foot per acre volume of a stand of trees divided by the age of the stand.

Cultural Material

Actual objects removed from an historic or archaeological property as part of a data recovery program, including but not limited to, artifacts, by-products of human activity such as flakes or stone, fragments of bone, and organic waste of various kinds, architectural elements, soil samples, pollen analysis, skeletal material, and works of art.

Cultural Resources

The cultural foundation of our Nation includes the remains or records of districts, sites, areas, structures, buildings, networks, neighborhoods, memorials, objects and events from the past which have scientific, historic or cultural value. They may be historic, prehistoric, archaeological, or architectural in nature. Cultural resources are an irreplaceable and nonrenewable aspect of our national heritage.

Cumulative Effects

The combined effects of two or more management activities. The effects may be related to the number of individual activities, or to the number of repeated activities on the same piece of ground. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

D

Data Recovery

The systematic removal of the scientific, prehistoric, historic, and/or archaeological data that provide a cultural resource property with its research or information value.

Debris Slide

A shallow landslide of soil, rock, and organic material that occurs on steep slopes.

Debris Torrent

A large debris slide that is changed with water and confined to a steep stream channel. Debris torrents may travel several thousand feet.

Decision Criteria

Essentially the rules or standards used to evaluate alternatives. They are measurements or indicators that are designed to assist a decision maker in identifying a preferred choice from an array of possible alternatives.

Deferred Forest Land

Productive forest land that has been administratively identified for study as possible addition to the National Wilderness Preservation System, or otherwise withdrawn from timber utilization under authority granted in the Code of Federal Regulations.

Deferred - Rotation

Any grazing system which provides for a systematic rotation of the delay or discontinuance of livestock grazing on an area to provide for plant reproduction establishment or restoration of vigor.

Demand

The amount of output that users are willing to take at specific price, time period, and conditions of sale.

Departure

A schedule which deviates from the principle of nondeclining flow of timber harvest by exhibiting an increase in cutting levels above sustainable levels followed by a planned decrease in the timber sale and harvest schedule at some time in the future.

Designated Area (Air Quality)

Those areas delineated in the Oregon and Washington Smoke Management Plans as principal population centers of air quality concern.

Designated Wild and Scenic River

A river which is part of the National Wild and Scenic River system.

Desired Residue Profile

The desired level of both living and dead woody material that is desired by the land manager for a specific site or prescription. Residue includes slash materials remaining from timber harvest, living brush and trees, standing dead trees and snags, and vegetative litter on the forest floor.

Destination Locations

Those areas people commonly seek for camping or day use.

Destination Resort

A recreation resort designed for multi-day use in contrast to single day use.

Developed Recreation Site

Distinctly defined-designated- area where facilities are provided for concentrated public use; e.g. campgrounds, picnic areas, boating sites, and ski areas. (Maintenance Levels are defined below.)

Developed Recreation Site Maintenance Levels

Level I - Minimum Level. Operation and Maintainence of developed recreation sites at a level that only meets minimum requirements for public health and safety and does not maintain facilities over time. At this level no funding is provided for upgrading of facilities or completion of any portion of the backlog rehabilitation needs associated with developed sites.

Level II - Low Standard. Operation and Maintenance of developed recreation sites at the level necessary to maintain facilities over time and protect investments in facilities and to complete approximately 50% of the backlog rehabilitation needs associated with developed sites.

Level III - Standard Service Level. Operation and Maintenance of developed recreation sites at a level that will insure normal life expectancy of facilities and at a level that meets Forest service "Green Book" (i.e. Full Service) standards of maintenance, service, compliance and insures the experience level for which the site is designed and meets other aspects of administration as outlined in Forest Service manuals and regulations. At this level one hundred percent of any backlog rehabilitation needs associated with developed sites will be completed.

Diameter Breast High (DBH)

The diameter of a standing tree at a point 4 feet, 6 inches from ground level.

Discount Rate

An interest rate that represents the cost or time value of money in determining the present value of future costs and benefits.

Discount Rate, Real

A discount rate adjusted to exclude the effects of inflation.

Discounting

An adjustment, using a discount rate, for the value of money over time so that costs and benefits occurring in the future are reduced to a common time, usually the present, for comparison.

Dispersed Recreation

Outdoor recreation that takes place outside developed recreation sites or the Wilderness.

Diverse Cultured Groups

Groups of people with differing ethnic values, norms, social structures and heritage.

Diversity

The distribution and abundance of different plant and animal communities and species within the area covered by a land and resource mangement plan. (36 CFR 219.3) See also Edge, Horizontal Diversity, and Vertical Diversity.

Domestic Water Source

A watershed which provides water for human consumption by an individual or individual that does not meet the criteria for a municipal watershed.

Drainage Pattern

The configuration or arrangement of stream drainage or other drainage patterns.

Duff

Organic matter in various stages of decomposition on the floor of the forest.

E

Earthflow - Deep (>100 ft.)

Rotational failure which occurs on gentle to moderate slopes.

High Risk - High potential for moss movement. Damage to facilities, loss of life or detrimental effects on fisheries or municipal water sources.

Moderate Risk - Moderate potential for movement. Less a risk of loss of life, damage to facilities or fisheries and municipal water sources encompass many acres.

Low Risk - Small in size. Little risk of loss of life, damage to facilities or fisheries and municipal water sources.

Ecosystem

An interacting system of organisms considered together with their environment; for example, marsh, watershed, and lake ecosystems.

Edge

The boundary between two or more elements of the environment; e.g. field and woodland.

Edge Contrast

A qualitative measure of the difference in structure of two adjacent vegetated areas; for example, low, medium, or high edge contrast.

Eligible Wild and Scenic River

Candidate river that is free flowing and contains at least one outstandingly remarkable value.

Effectiveness, Cost

Achieving specified outputs or objectives under given conditions for the least cost.

Effectiveness Index (Fire)

See Fire Management Efficiency Index.

Effects

Environmental consequences as a result of a proposed action. Included are direct effects, which are caused by the action and occur at the same time and place, and indirect effects, which are caused by the action and are later in time or further removed in distance, but which are still reasonably foreseeable. Indirect effects may include population growth-inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems.

The terms "Effects" and "Impacts" as used in this statement are synonymous. Effects may be ecological (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic quality, historic, cultural, economic, social, or health related, whether direct, indirect, or cumulative. Effects resulting from actions may have both beneficial and detrimental aspects, even if on balance the agency believes that the overall effects will be beneficial (40 CFR 1508.8).

Efficiency, Cost

The usefulness of specified inputs (costs) to produce specified outputs (benefits). In measuring cost efficiency, some outputs (such as environmental- mental, economic or social impacts) are not assigned monetary values but are achieved at specified levels in the least cost manner. Cost efficiency is usually measured using present net value, though use of benefit-cost ratios and rates-of-return may sometimes be appropriate.

Efficiency, Economic

The usefulness of inputs (costs) to produce outputs (benefits) and effects when all costs and benefits that can be identified and valued are included in the computations. Economic efficiency is usally measured using present net value, though use of benefit-cost ratios and rates-of-return may sometimes be appropriate.

Embeddedness

The degree to which larger particles on the stream bottom (boulders, rubble, or gravel) are surrounded or covered by fine sediment.

Endangered Species

Any species of animal or plant which is in danger of extinction throughout all or a significant portion of its range. Not included are members of the class Insects which have been determined by the Secretary to constitute a pest whose protection under the provisions of this Act (Endangered Species Act of 1973) would present an overwhelming and overriding risk to man. An endangered species must be designated in the Federal Register by the appropriate Federal Agency Secretary.

Endemic Plant

A plant confined to a certain country or region and with a comparatively restricted geographic distribution.

Energy Minerals

Minerals which produce energy. For example: oil, gas, geothermal, coal.

Enhancement

A short-term management practice which is done with the express purpose of increasing positive aspects of scenic variety where little variety now exists.

Environmental Analysis

An investigation and analysis of alternative actions and their predictable short- and -long-term environmental effects, incorporating the physical, biological economic, social, and cumulative effects. This process provides the information needed for identifying actions that may be categorically excluded or for preparing environmental documents as required.

Environmental Assessment

A concise public document required by the regulations implementing the National Environmental Policy Act.

Environmental Impact Statement (EIS) and Decision Documents Refers to a NEPA environmental assessment, environmental impact statement finding of no significant impact, decision notice, notice of intent or record of decision.

Ephemeral Stream or Drainage

A stream or portion of a stream that flows only in direct response to precipitation or snow melt. It receives little or no water from springs and no long-continued supply from snow or other sources. Ephemeral drainages frequently have no permanent or well-defined channels, but follow slight depressions in the natural contour of the ground surface.

Erodible

Susceptible to erosion.

Erosion

The wearing away or detachment of the land surface by running water, wind, ice, or other geological agents, including such processes as gravitation creep.

Erosion (Accelerated)

Erosion much more rapid than normal, primarily as a result of the influence or the activities of man.

Erosion (Natural)

Wearing away of the earth's surface by water, ice, or other natural agents under natural environmental conditions of climate, vegetation, etc., undisturbed by human activity.

Escaped Fire

A fire which has exceeded, or is anticipated to exceed, preplanned initial action capabilities or the fire management direction

Escape Cover

Usually vegetation dense enough to hide an animal; used by animals to escape from potential enemies.

Essential Habitat

Areas designated by the Forest Service Regional Forester that possess the same characteristics of critical habitat as those designated by the Secretary of the Interior or Commerce.

Eutrophication

Well-nourished, and "eutrophication" refers to the natural or artificial addition of nutrients to bodies of water and to the effects of any resulting stimulation of algal growth.

Evapotranspiration

Loss of water from a land area through transpiration of plants and from the soil.

Even-Aged Management

The application of a combination of actions that results in the creation of forest stands composed of trees of essentially the same age. Managed even-aged forests are characterized by a distribution of stands of varying ages (and, therefore, tree sizes throughout the forest area). The difference in age between trees forming the main canopy level of a stand usually does not exceed 20 percent of the age of the stand at harvest rotation age. Regeneration in a particular stand is obtained in a short period at or near the time that a stand has reached the desired age or size for regeneration and is harvested. Clearcut, shelterwood, or seed tree cutting methods produce even-aged stands. (36 CFR 219.3)

Even-Flow

Maintaining a relatively constant supply of timber from decade to decade.

Exclusion Area

An area having a statutory prohibition to rights-of-way for linear facilities or corridor designation.

Expected Burned Acreage

The expected annual number of acres burned by fire size class and intensity level for a given program option or budget level. Expected burn acreage must equal or be less than the resource protection objective to be a valid option.

Extended Shelterwood

This is a variation of the shelterwood system design to provide for other resources such as wildlife or scenery considerations. The term extended is used to denote the retention of the old stand for a longer period than is necessary or in many cases desirable for maximum growth of the new stand.

F

Facility Maintenance Class

The rating system used in the Recreation Information Management System to classify the condition and maintenance needs of recreational sites and areas.

Fee Campground

A fee campground must have as a minimum all of the following: tent or trailer spaces, drinking water, access road, refuse containers, toilet facilities, personal fee collection, reasonable visitor protection, and simple devices for containing a campfire where permitted.

Fire Management Analysis Zone

The geographically delineated areas into which the planning unit is divided for the purpose of fire management analysis. The delineation is based upon common fire-behavior characteristics which is the "corner stone" for fire planning and evaluation of fire effects.

Fire Management Efficiency Index

An index based on the FFP cost (less proposed fuels investment 115), evaluated annual FFF and expected annual net value change for the selected option. These three variables become the targets for the purpose of monitoring plan performance over time. The expected plan performance is adjusted annually based on the actual budget level and actual seasonal index in the monitoring process.

Fire Management Direction

The direction provided by an interdisciplinary team for each separate management area on the Forest. It includes guides by management area for long-term maximum burn acreages, specifying fire size and intensity, which would not adversely affect attainment of resource targets or outputs. In addition, it provides guidelines on desired residue profiles and the use of fire to meet resource prescriptions.

Fire Prevention Levels

Level I-Low Level of Prevention Under this level public contact is incidental; with fire prevention mentioned secondary to other messages.

There is infrequent use of fire regulations. Prevention signing occurs only as part of other informational signing.

Level II-Moderate Level of Prevention Under this level fire prevention contacts are planned; but secondary to other activities. Messages are structured to deal with specific risks. Fire regulations are utilized seasonally with restrictions possible on a site specific basis. Signing is informational and directed at specific risks.

Level III-High Level of Prevention Under this level contacts are planned; and frequent messages are structural with the primary reason for the contact being the fire prevention message or the enforcement of restrictions. Fire restrictions are frequently used with fire regulations in effect during fire season. Signing is primarily directive or restrictive. Fire instructions are often the reason for the contact.

Fish Passage

Passage of fish up or downstream especially over stream obstructions.

Floodplain

The lowland and relatively flat area adjoining inland waters, including, at a minimum, that area subject to a one percent or greater chance of flooding in any given year.

Forage

All browse and non woody plants available to livestock or wildlife for grazing or harvestable for feed.

Forbs

Non-woody plants, other than grasses. Term refers to feed used by both wildlife and domesticated animals.

Forest Development Transportation Plan

The Forest Development Transportation Plan is the official description of the forest development transportation system and consists of a base map or series of base maps showing the location of each facility and an inventory record defining their characteristics. These documents shall also serve as the forest development road system plan referenced in the National Forest Management Act.

Foreground

A term used in visual (scenery) management to describe the stand of trees immediately adjacent to a high-value scenic area, recreation facility, or forest highway (see Background, Middleground).

Forest Interdisciplinary Team (I.D. Team)

A Team representing several disciplines to insure coordination of the various resources. Team functions include developing the Forest Plan, establishing the standards and requirements by which planning and management activities will be monitored and evaluated, and for completing the annual evaluation report and recommending amendments.

Forest Land

Land at least 10 percent occupied by forest trees of any size or formerly having had such cover and not currently developed for non-forest use. Lands developed for non-forest use include areas devoted to crops, improved pasture, residential or administrative areas, improved roads of any width and adjoining road clearing and power line clearing of any width. (36 CFR 219.3)

Forest Plan Amendment

Formal alteration of the Forest Plan by modification, deletion or addition based upon nonsignificant or significant changes. Non significant changes are minor modification of management direction. Significant changes are major alterations of specific management prescription direction or land use designations. Unlike a complete Plan revision; an amendment addresses only the issues that trigger a need for a change. Amendments must satisfy both NFMA and NEPA procedural requirements, including appropriate public notification.

Forest Plan Goal

A concise statement that describes a desired condition to be achieved sometime in the future. It is normally expressed in broad, general terms and is timeless in that it has no specific date by which it is to be completed. Goal statements form the principal basis from which objectives are developed (36 CFR).

Forest Plan Monitoring

Observing and determining whether Forest Management Direction is being implemented as stated in the Forest Plan.

Forest Plan Objective

A concise, time specific statement of measurable planned results responding to established goals. An objective forms the basis for further planning to define the precise steps to be taken and the resources to be used in achieving identified goals.

Forest and Rangeland Renewable Resources Planning Act (RPA) 1974

An act of Congress requiring the preparation of a program for the management of the National Forest's renewable resources and preparation of land and resource management plans for units of the National Forest System. It also requires a continuing inventory of all National Forest System lands and renewable resources.

Forestwide Standard

A principle requiring a specific level of attainment; a rule to measure against. The Forest-wide Standards apply to all areas of the Forest regardless of the other prescriptions applied.

FORPLAN

A linear programing system used for developing and analyzing Forest Planning Alternative.

Fuelbreak

Any natural or constructed barrier utilized to segregate, stop, or control the spread of fire.

Fuels

Combustible wildland vegetative materials. While usually applied to above ground living and dead surface vegetation, this definition also includes roots and organic soils such as peat.

Fuel Treatment

The rearrangement or disposal of natural or activity fuels (generated by management activity, such as slash left from logging) to reduce fire hazard. Fuels are defined as both living and dead vegetative materials consumable by fire.

G

Game

Wildlife that are hunted for sport and regulated by State Game regulations.

General Distribution

The geographic area presently occupied, often on a seasonal basis, by a species within the planning area. Distribution is not to be confused with present occupancy of specific habitat(s). Resource management activities will create changes in habitat which will force local shifts in occupancy.

Geologic Analysis

Analysis performed on the land using geologic techniques and knowledge, usually performed by a geologist.

Geothermal

Of or pertaining to the inherent heat of the earth. Geothermal steam is a leasable mineral.

Goal

A concise statement that describes a desired condition to be achieved sometime in the future. It is normally expressed in broad general terms and is timeless in that it has no specific date by which it is to be completed. Goal statements form the principle basis from which objectives are developed. (36 CFR 219.3)

Goods and Services

The various outputs, including on-site uses, produced from forest and rangeland resources. (36 CFR 219.3)

Gradient

Change of elevation, velocity, pressure or other characteristics per unit length.

Group Selection Cutting

Removal of tree groups ranging in size from a fraction of an acre up to about 2 acres in area that is smaller than the minimum feasible for even-aged management of a single stand.

Guideline

An indication or outline of policy or conduct that is not a mandatory requirement (as opposed to a standard, which is mandatory.

H

Habitat

The place where a plant or animal naturally or normally lives and grows.

Habitat Component

A simple part, or a relatively complex entity, regarded as a part of an area or environment in which an organism or biological population normally lives.

Habitat Capability

The estimated ability of an area, given existing or predicted habitat conditions, to support a wildlife, fish or plant population. It is measured in terms of potential population numbers.

Habitat Diversity Index

A measure of habitat diversity improvement expressed as a percentage of optimum size class distribution that is achieved over time.

Hardwood

A broad-leaved flowering tree.

Harvest Cutting Method

A combination of interrelated actions whereby forests are tended, harvested, and replaced. The combination of management practices used to manipulate the vegetation in forests. Harvest cutting methods are classified as even-aged and uneven-aged.

Heaving

The partial lifting of plants out of the ground, frequently breaking their roots, as a result of freezing and thawing of the surface soil during the winter.

Hiding Cover

Vegetation capable of hiding 90 percent of a standing deer or elk from the view of a human at a distance of 200 feet.

High Standard

Maintaining recreational facilities to the fullest and best standard. High standard includes regular garbage pickup and frequent cleaning of facilities.

High Quality Habitat

Habitat which completely satisfies a species existence requirement.

History

People, places, things and events which have occurred or pertain to the time of written record. For the Pacific Northwest, the history of written documentation is approximately 1600 AD.

Horizontal Diversity

The distribution and abundance of plant and animal communities or successional stages across an area of land; the greater the number of communities, the higher the degree of horizontal diversity. This concept is close to, but not exactly the same as, "even-aged management," although each may influence the other. Application of even-aged management, for example, can be designed to accomplish horizontal diversity objectives. See also Vertical Diversity.

Human Resource Programs

Providing human and natural resource benefits through administering and hosting programs in work, training, and education for the unemployed, the underemployed, the elderly, the young and others with special needs.

Hundred Year Flood

Severe flood which, statistically, has a chance of occuring once in a hundred years, or has a 1% chance of occurring each year.

Hydrology

The scientific study of the properties, distribution, and effects of water in the atmosphere, on the earth's surface, and in soil and rocks.

Hyphoreic Zone

The subterranean areas below and adjacent to stream channels, which contain a complex community of small animals (i.e. insects and crustaceans) living in the gravels.

I

Impact, Economic

The change, positive or negative, in economic conditions, including distribution and stability of employment and income in affected local, regional, and national economies, which directly or indirectly results from an activity, project, or program.

Indian Tribe

The governing body of any Indian tribe, band, nation, or other group which is recognized as an Indian tribe by the Secretary of the Interior for which the United States holds land in trust or restricted status for the entity of its members. Such term also includes any Native village corporation, regional corporation, and Native group established pursuant to the Alaska Native Claims Settlement Act (36 CFR 800.2(g)).

Indicator Species

A wildlife management scheme in which the welfare of a selected species is presumed to indicate the welfare of other species.

Indicator Species Management

A wildlife management strategy to produce relatively high numbers of selected wildlife species in particular places for particular purposes.

Individual (single) Tree Selection

See Uneven-aged Silvicultural Systems.

Industrial Camping

Camps, cabins, or residences to house personnel employed in road construction, tree planting, logging, or other industries including prison camps. These uses range from seasonal or temporary to permanent; the occupation may be full or part-time.

Initial Action

The prompt, preplanned response to a wildfire.

Infiltration

The movement of water into the soil through pores or other openings.

Instream Flows

A prescribed level (or levels) of streamflow, usually expressed as a stipulation in a permit authorizing a dam or water diversion, for the purpose of meeting National Forest System management objectives.

Integrated Resource Management Approach

All resources are planned in the same area and scheduled over the next decade using an interdisciplinary approach. All further Forest Plan implementation actions are united and coordinated to achieve Forest Plan goals and objectives.

Interdisciplinary Approach

Utilize a team representing several disciplines to coordinate and integrate planning actions consistent with the principles of Multiple Use Sustained Yield Act.

Integrated Land and Resource Management Plan

A Forest Plan which considers all lands and all resources of the National Forest, in contrast to consideration of only part of the Forest's lands or just one of the resources.

Integrated Pest Management

A process for selecting stategies to regulate forest pests in which all aspects of a pest-host system are studied and weighed. The information considered in selecting appropriate strategies includes the impact of the unregulated pest population on various resources values, alternative regulatory tactics and strategies, and benefit/cost estimates for these alternative strategies. Regulatory strategies are based on sound silvicultural practices and ecology of the pest-host system and consist of a combination of tactics such as timber stand improvement plus selective use of pesticides. A basic principle in the choice of strategy is that it be ecologically compatible or acceptable. (36 CFR 219.3)

Intensive Forest Management

A high investment level of timber management that envisions initial harvest, regeneration with genetically improved seedling stock, control of competing vegetation, fill-in planting, precommercial thinning as needed for stocking control, one or more commercial thinning, and final harvest.

Interdisciplinary Team

A team of people that collectively represent several disciplines and whose duty it is to coordinate and integrate the planning activities. See also Forest Interdisciplinary Team (I.D. Team).

Intermittent Stream

A stream that flows above ground at intervals or only flows periodically during the year. In contrast to ephemeral drainages (see definition), intermittent streams generally have well-defined channels.

Inventoried Roadless Area

Areas of undeveloped Federal land, greater than 5,000 acres in size, within which there are no improved roads maintained for travel by means of motorized vehicles intended for highway use. Exceptions are those areas less than 5,000 acres manageable in their natural condition, contiguous to existing wilderness, or are of issue to the public.

Inventory

Strategies designed to collect existing information and locate cultural resources in a specific area, such as through field survey, records search, oral interviews, and archival study.

Irretrievable

Applies to losses of production, harvest, or use of renewable natural resources. For example, some or all of the timber production from an area is irretrievably lost during the time an area is used as a winter sports site. If the use is changed, timber production can be resumed. The production lost is irretrievable, but the action is not irreversible.

Irreversible

Applies primarily to the use of nonrenewable resources, such as minerals or cultural resources, or to those factors, such as soil productivity, that are renewable only over long time periods. Irreversible also includes loss of future options.

Issue

A point, matter, or question of public discussion or interest to be addressed or decided through the planning process.

K

Key Interest Areas

Any interesting feature or condition in an area that attracts people. For example, a waterfall along a trail or road, a scenic overlook or a wildlife viewing area.

Key Site Riparian Areas

Large riparian areas exhibiting high habitat diversity and outstanding capabilities for producing high quality water, excellent fish spawning and rearing habitat, high quality waterfowl breeding, nesting and resting habitat, wildlife cover and diverse plant communities.

Knutson-Vandenberg Act

Legislation authorizing the collection of money from timber sale receipts for reforestation, stand improvements, and other resource improvement or mitigation projects on timber sale areas.

Kuchler Vegetative Types

Potential natural vegetation of the contiguous United States, classified by A. W. Kuchler.

K-V

An abbreviation for Knutson-Vandenberg.

L

Land Allocation

The assignment of a management emphasis to particular land areas with the purpose of achieving the goals and objectives of that alternative.

Landings

Those designated areas within a timber sale where logs are temporarily stored before transport to a mill.

Landslide

The group of slope movements wherein shear failure occurs along a specific surface or combination of surfaces.

Debris Flow. General designation for all types of rapid flowage involving debris of various kinds of conditions.

Debris Slide. A shallow landslide of soil, rock, and organic material that occurs on steep slopes.

Earthflow. A mass movement process and landform characterized by a downslope flow of earth and weathered rock. Slopes are usually 30% or less, rate of movement is imperceptible to slow, depth is variable, area can be several acres to several miles in size.

Slump. Downward slipping of a mass of material moving as a unit or several subsidiary units usually with a backward rotation.

Large Woody Debris

Logs, tree boles, and root wads greater than 4 inches in diameter.

Leasable Minerals

All minerals except salable minerals on acquired lands. All minerals on Outer Continental shelf. Coal; phosphate; oil; gas; chlorides, sulfates, carbonates, borates, silicates or nitrates of potassium and sodium; native asphalt, solid and semi-solid bitumen and bitumenous rock including oil-impregnated rock or sands from which oil is recoverable only by special treatment after the deposit is mined Geothermal resources.

Legal Trout

A trout six inches or longer is legal by registration in the State of Oregon.

Life Form

How a species makes its living, also called a niche.

Limiting Habitat

Habitat which completely satisfies existence requirements.

Limits of Acceptable Change (LAC)

Maximum limit of human-caused change allowed in wilderness. Each WRS Class has a set of limits which presupposes that certain areas of wilderness (trails) will be allowed to receive higher levels of use than other areas (trailless), and thus will receive more change or resource impact. LAC's are not a management objective, but a maximum limit.

Litter

The uppermost layer of organic debris on the ground under a vegetation cover, i.e. essentially the freshly fallen or only slightly decomposed vegetable material, mainly from foliage but also bark fragments, twigs, flowers, fruits, etc.

Livestock Management Strategies

Strategy B - Environmental Management with Livestock - Livestock use is within the apparent present capacity of the range environment. Investments for range management are applied only to the extent required to maintain the environment at a stewardship level in the presence of grazing. Investments for implementation may be very low for some resource classes. Resource impacts resulting from past use is charged to benefiting or stewardship functions. The goal for the strategy is to attain livestock control. No attempt is made to achieve livestock distribution (i.e. animal structural improvements).

Strategy C - Extensive Management of Environment and Livestock - Management systems and techniques, including fencing and water developments, are applied as needed to obtain relatively uniform livestock distribution and plant use, and to maintain plant vigor. Management seeks full utilization of the animal unit months available for livestock grazing. No attempt is made to maximize livestock forage production by silvicultural practices such as seeding. On the Mt. Hood National Forest, Management Level C will be proper classification of allotments where an attempt is made (or planned) to realize benefits from the full productive potential of native vegetation occurring in the area. This would include all structural improvements of the allotment.

Strategy D - Intensive Management of Environment and Livestock - All available technology for range and livestock management is considered. Management seeks to maximize livestock forage production consistent with constraints of maintaining the environment and providing for multiple use. Existing vegetation may be replaced through improvement in growing conditions. Structures may be installed to accommodate complex livestock management systems and practices. Advanced livestock management practices are commonplace. Management toward this end means and attempts are made at maximizing livestock forage production through improvement developments up to and including range revegetation.

Range revegetation includes forage seeding, prescribed burning, and other silvicultural treatments where the primary purpose of the action is to increase forage for domestic livestock production.

Local Roads

Connect terminal facilities such as log landings and recreation sites, with forest collector roads, forest arterial roads, or public highways. Location and standards are determined by the specific resource needs that the roads serve.

Locatable Minerals

Those hardrock minerals which can be obtained by filing a claim on Public Domain or National Forest System lands reserved from the Public Domain. In general, the locatable minerals are those hardrock minerals which are mined and processed for the recovery of metals, but may also include certain nonmetallic minerals and uncommon varieties of mineral materials.

Long-Term Sustained Yield Timber Capacity

The highest uniform wood yield from lands being managed for timber production that may be sustained under a specified management intensity consistent with multiple-use objectives. (36 CFR 219.3)

Low Standard

Maintaining recreational facilities to the point that health and safety of the public is the only concern. Services are minimal.

M

M

Thousand

Maintenance Levels 1-5

Level 1. This level is assigned to intermittent service roads during the time management direction requires that the road be closed to motorized traffic.

Level 2. This level is assigned where management direction requires that the road be open for limited passage of traffic. Roads in this maintenance level are intended for use by high clearance vehicles and not maintained passenger car traffic.

Level 3. This level is assigned where management direction requires that the road be open and maintained for safe travel by a prudent driver in a standard four wheel passenger car.

Level 4. This level is assigned where management direction requires the road to provide a moderate degree of user comfort and convenience at moderate travel speeds. Traffic volumes are normally sufficient to require a double lane aggregate surfaced road. Paved surfaces are often used.

Level 5. This level is assigned where management direction requires the road to provide a high degree of user comfort and convenience. These roads are normally double lane, paved facilities.

Management Area

An area with similar management objectives and a common management prescription. In Region 6, a management area is the contiguous area assigned to a specific management strategy (the management strategy then becomes the management prescription).

Management Concern

An issue, problem, or a condition which constrains the range of management practices identified by the Forest Service in the planning process. (36 CFR 219.3)

Management Direction

A statement of multiple-use and other goals and objectives, the associated management prescriptions, and standards and guidelines for attaining them. (36 CFR 219.3)

Management Intensity

A management practice or combination of management practices and associated costs designed to obtain different levels of goods and services. (36 CFR 219.3)

Management Practice

A specific activity, measure, course of action, or treatment. (36 CFR 219.3)

Management Prescription

Management practices and intensity of management selected and scheduled for application on a specific area to attain multiple-use and other goals and objectives. (36 CFR 219.3)

Market Resources

Products derived from renewable and nonrenewable resources that have a well-established market value; for example, forage, timber, water, and minerals.

Mass Movement

Downslope, unit movement of a portion of the land's surface; i.e. a single landslide or the gradual simultaneous, downhill movement of the whole mass of loose earth material on a slope face.

Mature Timber

Trees that have attained full development, particularly in height, and are in full seed production.

Maximum Modification

A visual quality objective meaning man's activity may dominate the characteristic landscape but should appear as a natural occurrence when viewed as background.

MBF

Thousand board feet. A measure of wood volume.

MCF

Thousand cubic feet. A measure of wood volume.

Mean Annual Increment of Growth

The total increase in girth, diameter, basal area, height, or volume of individual trees or a stand up to a given age, divided by that age.

Middleground

The visible terrain beyond the foreground where individual trees are still visible but do not stand out distinctly from the stand.

Mineral Entry

The filing of a mining claim upon public domain or related land to obtain the right to any minerals it may contain.

Mineral Entry Withdrawal

The exclusion of mining locations and mineral development work on areas required for administrative sites by the Forest Service and other areas highly valued by the public.

Mineral Materials

Deposits such as sand, stone, gravel, and clay.

Mineral Potential

A rating system for mineral resources based on the degree to which certain criteria indicates favorable potential for development of mineral resources.

High Mineral-Resource Potential. Exists where geologic, geochemical and/or geophysical characteristics favorable for mineral accumulations are known to be present, or where geophysical characteristics strongly support the possibility of mineral accumulation, and evidence shows that mineralization has occurred. This rating covers existing mineral producing areas and known "Mining Districts".

Moderate Mineral-Resource Potential. Exists where geologic, geochemical and/or geophysical characteristics can reasonably be interpreted to be present, but where evidence of mineralization has not yet been found.

Low Mineral-Resource Potential. This rating is assigned to areas where geologic, geochemical and/or geophysical characteristics are unfavorable, or where evidence indicates that mineral concentrations are unlikely. This rating also covers areas with obvious but dispersed and apparently uneconomical mineral occurances.

Unknown Mineral-Resource Potential. This rating is used for areas where the level of knowledge of the mineral resource is so inadequate that a classification would be unjustified.

Mineral Withdrawal

The exclusion of locatable mineral deposits from mineral entry on areas required for administrative sites by the Forest Service and other areas highly valued by the public. Public lands withdrawn from entry under the General Mining Laws and/or the Mineral Leasing Laws.

Minimum Management Requirements (MMRs)

Requirements on forest management mandated by the Regional Office intended to minimally protect resources such as riparian areas and sensitive species of wildlife.

Minimum Viable Population

The lowest population which has adequate numbers and dispersion of reproductive individuals to ensure the continued existence of the species population on the planning area.

Mining Claims

That portion of the public estate held by law for mining purposes in which the right of exclusive possession of locatable mineral deposits is vested to the locator of a deposit.

Mitigation

Actions to avoid, minimize, reduce, eliminate, or rectify the impact of a management practice.

MM

Million.

MMBF

Million board feet.

MMCF

Million cubic feet.

Monitoring

A process to collect significant data from defined sources to identify departures or deviations from expected plan outputs.

Modification

A visual quality objective meaning man's activity may dominate the characteristic landscape but must, at the same time, utilize natural established form, line, color, and texture. It should appear as a natural occurrence when viewed in foreground or middleground.

Multilayered Canopy

A stand of trees with two or more distinct tree layers in the canopy.

Multiple Use

The management of all the various renewable surface resources of the National Forests so that they are utilized in the combination that will best meet the needs of the American people. The concept also includes making the most judicious use of the land for some or all of these resources or related services over areas large enough to provide sufficient latitude for periodic adjustments in the use to conform to changing needs and conditions. Some lands will be used for less than all of the resources. There will be harmonious and coordinated management of the various resources, each with the other, without impairment of the productivity of the land. Consideration will be given to the relative values of the various resources, and management will not necessarily favor the combination of uses that will give the greatest dollar return or the greatest unit output.

Multidisciplinary Approach

An approach whereby one of more disciplines representing a unique value or resource provides input to an I.D. Team or to management.

Municipal Supply Watershed

A watershed that provides water for human consumption where Forest Service management could have a significant effect upon the quality of water at the point of intake. The watershed must provide water utilized by a community or any other public water system regularly serving 25 individuals at least 60 days out of the year or provide at least 15 service connections.

N

National Environmental Policy Act (NEPA) (1969)

An Act, to declare a National policy which will encourage productive and enjoyable harmony between man and his environment; to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man; to enrich the understanding of the ecological systems and natural resources important to the nation; and to establish a Council on Environmental Quality.

National Forest Management Act (NFMA)

An Act passed in 1976 amending the Forest and Rangeland Renewable Resources Planning Act. NFMA requires the prepartion of Regional and Forest Plans and the preparation of regulations to guide that development.

National Forest Systems

All National Forest lands reserved or withdrawn from the public domain of the United States, all National Forest lands acquired through purchase, exchange, donation, or other means, the National Grasslands and land utilization projects administered under Title III of the Bankhead-Jones

Farm Tenant Act (50 Stat. 525, 7 U.S.C. 1010-1012), and other lands, waters or interests therein which are administered by the Forest Service or are designated for administration through the Forest Service as a part of the system. (16 U.S.C. 1608)

National Register "Criteria of Significance"

The criteria established for use in evaluating whether properties qualify for listing in the National Register of Historic Places. These criteria refer to the quality of significance in American history, architecture, archaeology, and culture which exists in districts, sites, buildings, structures, and objects of National, State and local importance that possess integrity of location, design, setting, materials, workmanship, feeling, and association.

National Register - Eligible Property

A property that has been determined eligible for National Register listing by the Secretary of the Interior, or one that has not yet gone through the formal eligibility-determination process but meets the National Register criteria. For management purposes, an "eligible" property is treated as if it were already listed.

National Registry of Natural Landmarks

National inventory and listing of all or part of recreation areas classified under 36 CFR 294.1 and research natural areas classified under 36 CFR 251.23 which have values illustrating the ecological or geological character of the Nation.

Natural Forest

The condition of a forest environment at any point in time including its associated plant and animal communities, which has been reached essentially through the process of natural succession. This process would include the effects of natural catastrophic occurrences.

NDF

An abbreviation of Non-Declining Flow.

NEPA

An abbreviation of National Environmental Policy Act.

Net Public Benefits

An expression used to signify the overall long-term value to the nation of all outputs and positive effects (benefits) less all associated inputs and negative effects (costs) whether they can be quantitatively valued or not. Net public benefits are measured by both quantitative and qualitative criteria rather than a single measure or index. The maximization of net public benefits to be derived from management of the units of the National Forest System is consistent with the principles of multiple-use and sustained-yield. (36 CFR 219.3)

Net Value Change

The estimation process carried out by an interdisciplinary team to assess positive and negative effects of individual resource allocation or management area designation. An estimation of physical effects and economic consequences of various fire intensity levels.

NFMA

An abbreviation of the National Forest Management Act of 1976.

Non-Chargeable Timber Harvest

Timber harvest that is not chargeable to the allowable sale quantity.

Non-Declining Flow (NDF)

A level of timber production assigned so that the planned timber sale and harvest for any future decade is equal to or greater than the planned sale and harvest for the preceding decade.

Non-Game

Any species of wildlife or fish which is not managed or otherwise controlled by hunting, fishing, or trapping regulations.

Non-Market

Products derived from National Forest resources that do not have a well-established market value, for example, recreation, wilderness, wildlife.

Non-Point

Refers to area sources of water pollution such as a watershed in contrast to a point source such as an outlet from a factory.

Non-Traditional Groups

Group of people which have not historically used the Forest or been involved in its management.

Noxious Weeds

A plant considered to be extremely destructive or harmful to agriculture and designated by law. An undesirable species that conflicts with, restricts, or otherwise causes problems with the management objectives.

NPB

An abbreviation of net public benefits.

O

Objective

A concise, time-specific statement of measurable planned results that respond to pre-established goals. An objective forms the basis for further planning to define the precise steps to be taken and the resources to be used in achieving identified goals. (36 CFR 219.3)

Occupancy Trespass

The illegal occupation or possession of National Forest land or property.

Off-Road Vehicle (ORV)

Any motorized vehicle designed for or capable of cross-country travel on or immediately over land, water, snow, ice, or other natural terrain. Non-motorized Mountain Bicycle use is also considered an Off-Road Vehicle.

Old Growth Stand

An old-growth stand is defined as any stand of trees 10 acres or greater generally containing the following characteristics: 1) stands contain mature and overmature trees in the overstory and are well into the mature growth stage; 2) stands will usually contain a multilayered canopy and trees of several age classes; 3) standing dead trees and down material are present; and 4) evidence of human activity may be present but does not significantly alter the other characteristics and would be a subordinate factor in a description of such a stand.

For additional information on how old growth was defined on the Mt. Hood National Forest, see FEIS-Chapter 3.

Oligotrophic

Lakes having low nutrient supplies which are poor producers of organic matter.

Opportunity Cost

The value of benefits forgone from an alternative.

Optimum Density

For wildlife, the maximum rate of animal stocking possible without inducing damage to vegetation or related resources, may vary from year to year because of environmental and/or population factors.

ORV

An abbreviation for off-road vehicles.

Other Native American

This term refers to American Indians, including Carib and Arawak, Eskimo and Aleut, and Native Micronesians and Polynesians, who are identified by themselves and recognized by others as members of a named cultural group that historically has shared linguistic, cultural, social, and other characteristics, but that is not necessarily an Indian tribe as defined above.

Output

A good, service, or on-site use that is produced from forest and rangeland resources. See FSH 1309.11 for forest and rangeland outputs, codes and units of measure. Examples: X06 - Softwood Sawtimber production - MCF; X80 - Increased Water Yield - Acre feet; W01 - Primitive Recreation Use - RVDs

Outreach

The efforts the agency makes to inform members and groups within the community of opportunities offered by the Forest including contract, volunteer, foraging or gathering, employment, and recreation opportunities.

Outstandingly Remarkable Values

River related resource value that is rare, unique or exemplary. The value is significant at a Regional or National level.

Overstory

That portion of the trees in a forest of more than one story, forming the upper or uppermost canopy layer.

P

PAOT

Persons-At-One-Time - Public recreational measurement term. The number of people in an area or using a facility at one time.

PARS

The burned acreage and fire occurrence guidelines which represent the annual average long-term fire loss. PARS are expressed by size class and fire intensity levels.

Partial Retention

A visual quality objective where man's activities may be evident but subordinate to the characteristic landscape.

Particulates

A component of polluted air consisting of any liquid or solid particles suspended or falling through the atmosphere.

Patented Mining Claims

A patent is a document which conveys a title. Public law provides that when patented, a mining claim becomes private property and is land over which the United States has no property rights, except as may be reserved in the patent. After a mining claim is patented, the owner does not have to comply with requirements of the General Federal Mining law, but is required to meet State regulations.

Payment in Lieu of Taxes

Payments to local or State governments based on ownership of Federal land and not directly dependent on production of outputs or receipt sharing. Specifically, they include payments made under the Payments in Lieu of Taxes Act of 1976, P.L. 94-565 Stat. 2662; 31 U.S.C 1601-1607 (Note these payments are in addition to payments made from gross receipts from forest products made under the Twenty-Five Percent Fund Act of May 1908).

Peak Discharge, Peak Flow

The maximum volume of flow attained at a given point in a stream during a runoff event.

Percolation

The downward movement of water within or through the soil, especially the downward flow of water in saturated or nearly saturated soil.

Perennial Stream

A stream that flows throughout the year.

Permanent Road Closure

Roads closed with the intent to never use them again, action taken to make them impassable and remove them from the transportation system.

Personal Use Firewood

Firewood gathered for use by the woodcutter. Resale of personal use firewood is not allowed.

Persons-at-one-time (PAOT)

A recreation capacity measurement term indicating the number of people that can use a facility or area at one time.

Physically Challenged Individuals

Persons with physical conditions that require specialized access or equipment needed to assist them in walking, seeing, hearing, learning or lifting.

Planning Area

The area of the National Forest System covered by a regional guide or Forest Plan. (36 CFR 219.3)

Planning Horizon

The overall time period considered in the planning process that spans all activities covered in the analysis or plan and all future conditions and effects of proposed actions which would influence the planning decisions. (36 CFR 219.3)

Planning Period

One decade. The time interval within the planning horizon that is used to show incremental changes in yields, costs, effects, and benefits. (36 CFR 219.3

Plant Communities

A vegetation complex unique in its combination of plants which occur in particular locations under particular influences. A plant community is a reflection of integrated environmental influences on the site - such as soils, temperature, elevation, solar radiation, slope, aspect, and rainfall.

PNV

An abbreviation of present net value.

PNW-447

Pacific Northwest Research Note 447 of July 1986.

Pool Habitat

That portion of the stream with reduced current velocity, often with water deeper than the surrounding areas, and which is frequently usable by fish for resting and cover.

Pool Tailouts

That portion of the pool that is downstream of the deepest part of the pool as the pool becomes shallower and before it becomes a riffle.

Potential Yield

The sustainable output of wood fiber available after the needs of other forest uses have been deducted from the Biological Potential.

Practices

Those management activities that are proposed or expected to occur.

Precommercial Thinning

The selective felling or removal of trees in a young stand, primarily to accelerate diameter increment on the remaining stems, maintain a specific stocking or stand density range, and improve the vigor and quality of the trees that remain.

Prehistory

People, places, things and events which have occurred or pertain to the time before written record.

Prescribed Fire

A wildland fire burning under specified conditions which will accomplish certain planned objectives. The fire may result from either planned or unplanned ignitions. Proposals for use of unplanned ignitions for this purpose must be approved by the Regional Forester.

Prescribed Natural Fire

The use of unplanned natural ignitions to meet management prescriptions.

Present Net Value (PNV)

The difference between the discounted values (benefits) of all outputs to which monetary values or established market prices are assigned, and the total discounted costs of managing the planning area. (36 CFR 219.3) In Forest Planning; monetary values were assigned to timber stumpage, recreation visitor days (RVDs), wildlife/fish related recreation visitor days (WFVDs), grazing use and mineral outputs.

Preservation

A visual quality objective that allows only ecological changes to take place.

Presuppression

Activities required in advance of fire occurrence to ensure an effective suppression action. It includes (1) recruiting and training fire forces, (2) planning and organizing attack methods, (3) procuring and maintaining fire equipment, and (4) maintaining structural improvements necessary for the fire program.

Price

The unit value of an output expressed in dollars.

Primary Recreational Use Season

The seasonal period of time when an area is most commonly used. For example, the primary recreational use seasons for the Mt. Hood climbing routes are generally March through May, and July through August or September.

Primitive Recreation

Those recreation activities which occur in areas characterized by an essentially unmodified natural environment of fairly large size (2,500 acres or greater).

Production Potential

The capability of the land or water to produce a given resource.

Productive Forest Lands

Forest lands that are capable of producing crops of industrial wood and have not been reserved or deferred from timber management.

Program Development and Budgeting

The process by which forest management activities are proposed and funded.

Program Element

An individual Forest Service area of responsibility, which in combination with other elements, comprises the statutory or Executive directed mission of the Forest Service. Specific Forest Service program elements are defined in the Management Information Handbook (FSH 1309.11).

Programmed Harvest

The part of the potential timber yield that is scheduled for harvesting. Includes salvage and cull timber volumes. It is based on current demand, funding, and multiple use considerations.

Public Access

Usually refers to a road or trail route over which a public agency claims a right-of-way for public use.

Public Issue

A subject or question of widespread public interest relating to management of the National Forest System. (36 CFR 219.3)

Purchaser Road Credit

Credit earned by the purchaser of a National Forest timber sale in return for construction of contract-specified roads. Earned purchaser credit may be used by the purchaser as payment for National Forest timber removed.

R

Radio Telemetry

A radio signal that is used to measure the position and/or movement of a wild animal. The radio transmitter is attached to the animal, and a receiver is used by a researcher to locate the animal in its natural habitat.

Range

Satisfactory Condition - On suitable range, forage condition is at least fair, with stable trend, and allotment is not classified PC (basic resource damage) or PD (other resource damage).

PC (Basic Resource Damage) - Allotments will be classified as PC when analysis or evaluation indicates that one or more of the following conditions exist and livestock use on the allotment is or has been a major factor contributing to this condition.

a. Maximum summer water temperatures are elevated above State standards or other approved criteria on SMU class I or II streams and this is largely due to the loss of shade-producing vegetation in the allotment.

Range Allotment

A designated area containing land suitable and available for livestock grazing use upon which a specified number and kind of livestock are grazed under an approved allotment management plan. It is the basic management unit of the range resource on National Forest System lands administered by the Forest Service.

Range Allotment Plan

A long term operating plan for a growing allotment designed to reach a given set of objectives and meet forest plan standards and guidelines. It is prepared with input from the permittee.

Ranger District

An administrative subdivision of the Forest, supervised by a District Ranger who reports to the Forest Supervisor.

Raptors

Any predatory bird - such as a falcon, hawk, eagle or owl - that has feet with sharp talons or claws adapted for seizing prey and a hooked beak for tearing flesh.

Rare II

An abbreviation of Roadless Area Review and Evaluation II. Rare II was an extension of the Rare I process to inventory and map all roadless areas remaining on National Forests Lands.

Real Dollar Value

A monetary value that compensates for the effects of inflation. (36 CFR 219.3)

Recreation Information Management (RIM)

The Forest Service system for recording recreation facility condition and use.

Recreation Opportunity

An opportunity for a user to participate in a preferred activity within a preferred setting, in order to realize those satisfying experiences which are desired.

Recreation Opportunity Spectrum (ROS)

Land delineations that identify a variety of recreation experience opportunities categorized into six classes on a continuum from primitive to urban. Each class is defined in terms of the degree to which it satisfies certain recreation experience needs. This is measured based on the extent to which the natural environment has been modified, the type of facilities provided, the degree of outdoor skills needed to enjoy the area, and the relative density of recreation use. The seven classes are:

Primitive. Area is characterized by an essentially unmodified natural environment of fairly large size. Interaction between users is very low, and evidence of other users is minimal. The area is managed to be essentially free from evidence of management restrictions and controls. Motorized use within the area is not permitted.

Semiprimitive Nonmotorized. Area is characterized by a predominantly natural or natural-appearing environment of moderate to large size. Interaction between users is low, but there is often evidence of other users. The area is managed in such a way that minimum on-site controls and restrictions may be present, but subtle. Motorized recreation use is not permitted, but local roads used for other resource management activities may be present on a limited basis. Use of such roads is restricted to minimize impacts on recreational experience opportunities.

Semiprimitive Motorized. Area is characterized by a predominantly natural or natural-appearing environment of moderate to large size. Concentration of users is low, but there is often evidence of other users. The area is managed in such a way that minimum on-site controls and restrictions may be present, but subtle. Motorized recreation use of local primitive or collector roads with predominantly natural surfaces and trails suitable for motor bikes is permitted.

Roaded Modified. A subclass of the Roaded Natural ROS class. Involves areas that are characterized by predominantly natural appearing environments with high evidence of the sights and sounds of humans. Such evidence may not harmonize with the natural environment. Interaction between users may be moderate to high, with evidence of other users prevalent. Resource modification and utilization practices are evident and may not harmonize with the natural environment. Conventional motorized use is allowed and incorporated into construction standards and design of facilities.

Roaded Natural. Area is characterized by predominantly natural-appearing environments with moderate evidence of the sights and sounds of man. Such evidence usually harmonizes with the natural environment. Interaction between users may be moderate to high, and evidence of other users prevalent. Resource modification and utilization practices are evident but harmonize with the natural environment. Conventional motorized use is allowed and incorporated into construction standards and design of facilities.

Rural. Area is characterized by a natural environment that has been substantially modified by development of structures, vegetative manipulation, or pastoral agricultural development. Resource modification and utilization practices may be used to enhance specific recreation activities and to maintain vegetative cover and soil. Sights and sounds of humans are readily evident, and the interaction between users is often moderate to high. A considerable number of facilities are designed for use by a large number of people. Facilities are often provided for special activities. Moderate user densities are present away from developed sites. Facilities for intensified motorized use and parking are available.

Urban. Area is characterized by a substantially urbanized environment, although the background may have natural-appearing elements. Renewable resource modification and utilization practices are often used to enhance specific recreation activities. Vegetative cover is often exotic and manicured. Sights and sounds of humans are predominant on site and in nearby areas. Facilities for highly intensified motor use and parking are available with forms of mass transit often available to carry people throughout the site.

Recreation Visitor Day (RVD)

A unit for measuring recreation use, with 12 visitor hours in a visitor day. This may consist of one person for 12 hours, 12 persons for one hour, or any equivalent combination of continuous or intermittent recreation use by individuals or groups.

Recreational Mining

A leisure-time activity involving the search for and collection of mineral specimens using nonsurface disturbing methods.

Reforestation

The natural or artificial restocking of an area with forest trees; most commonly used in reference to artificial restocking.

Regeneration

The actual seedlings and saplings existing in a stand; or the act of establishing young trees naturally or artificially.

Regeneration Cut

Any removal of trees to make regeneration possible.

Region

An area covered by a Regional guide. See FSM 1221.3 for organizational definitions.

Regional Forester

The official responsible for administering a single Forest Service region.

Regulated Harvest

Harvest that contributes chargeable timber volume to the Allowable Sale Quantity.

Regulated Volume

Same as Allowable Sale Quantity.

Rehabilitation

A short-term management alternative used to return existing visual impacts in the natural landscape to a desired visual quality.

Release

Freeing a tree or group of trees from competition by cutting or otherwise eliminating vegetation that is overtopping or closely surrounding them.

Removal Cut (Final Cut)

The removal of the last seed bearing or shelter trees after regeneration is established under a shelterwood method.

Representative Fires

The grouping of fires to allow the evaluation of planned initial action fire fighting forces. The grouping of fire occurrence into representative fires is based on the differences in dispatch response or resource mix within a Fire Management Analysis Zone (FMAZ).

Research Natural Area

An area of land in as near a natural condition as possible that exemplifies typical or unique vegetation and associated biotic, soil, geologic, and aquatic features. The area is set aside to preserve a representative sample of an ecological community primarily for non-manipulative scientific and education purposes.

Reserved Forest Land

Productive public forest land withdrawn from timber utilization through statute or administrative regulations.

Resident Trout

A trout which spends its entire life in fresh water.

Residual Stand

The trees remaining standing after some form of selection cutting is performed on a stand.

Residue

Material which includes both desired and unwanted vegetative residues which result from an activity or natural event.

Resource Protection Objective

A specified statement of measurable results to be achieved within a stated time period. The Fire Management direction established by the Interdisciplinary Team for maximum burn acreage and fire size.

Responsible Line Officer

For land management planning purposes, the Forest Service employee who has been delegated the authority to carry out a specific planning action. (36 CFR 219.3)

Rest-Rotation

A system of grazing mangement which defines systematically recurring periods of grazing and deferment for two or more pastures or management units.

Retention

A visual quality objective where human activities are not evident to the casual forest visitor.

Riffle

A feature of a stream having swift-flowing, turbulent water; can be either deep or shallow; features are generally cobble or boulder dominated.

Riparian

Pertaining to areas of land directly influenced by water. Riparian areas usually have visible vegetative or physical characteristics reflecting this water influence. Streamsides, lake borders, or marshes and wetlands are typical riparian areas.

Riparian Area

Geographically delineated areas, with distinctive resource values and characteristics, that are comprised of aquatic and riparian ecosystems. On the Mt. Hood National Forest riparian areas typically include areas adjacent to all streams, lakes, and ponds and areas comprising seeps, springs, and wetlands.

Riparian Ecosystems

A transition between the aquatic ecosystem and the adjacent upland terrestrial ecosystem. Identified by soil characteristics and distinctive vegetation communities that require free or unbound water.

Riparian Vegetation

Vegetation growing on or near the banks of a stream or body of water on soils that exhibit some wetness characteristics during some portion of the growing season.

Risk

The degree and probability of loss based on chance.

Runoff

The flow or discharge of water from an area, including both surface and subsurface flow.

RNA

An abbreviation of Research Natural Area.

Road

A general term denoting a way for purposes of travel by vehicles greater than 40 inches in width.

Forest Arterial Road. Provides services to large land areas and usually connects with public highways or other Forest arterial roads to form an integrated network of primary travel routes. The location and standard are often determined by a demand for maximum mobility and travel efficiency rather than specific resource management service. It is usually developed and operated for long-term land and resource management purposes and constant service (FSM 7710.51).

Forest Collector Road. Serves smaller land areas than a Forest arterial road and is usually connected to a Forest arterial or public highway. Collects traffic from Forest local roads and/or terminal facilities. The location and standard are influenced by both long-term multiresource service needs as well as travel efficiency. May be operated for either constant or intermittent service, depending on land use and resource management objectives for the area served by the facility (FSM 7710.51).

Forest Local Road. Connects terminal facilities with Forest collector or Forest arterial roads or public highways. The location and standard are usually controlled by specific resource activity requirements rather than travel efficiency needs (FSM 7710.51).

Roadless Area

See Inventoried Roadless Area.

ROS

An abbreviation of Recreation Opportunity Spectrum.

Rotation Age

The age of a stand when harvested.

Round Wood

Commercially valuable wood that is generally too small to be made into boards.

RPA

The Forest and Rangeland Renewable Resources Planning Act of 1974. Also refers to the National Assessment and Recommended Program developed to fill the requirements of the Act.

RPA Resource Targets

Quantified resource goals stated in the Forest Service Region 6 plan.

RVDs

An abbreviation of Recreation visitor Days.

S

Salable Minerals

Common varieties of sand, stone, gravel, cinders, pumice, pumicite and clay.

Sale Schedule

The quantity of timber planned for sale by time period from an area of suitable land covered by a forest plan. The first period (usually a decade) of the selected sale schedule provides the allowable sale quantity. Future periods are shown to ensure that long term sustained yield will be achieved and maintained. (36 CFR 219.3)

Salmonoid Smolt

Juvenile fish of the salmon/trout family going through biochemical changes during its migration to the ocean.

Sanitation Cutting (Salvage)

The removal of dead, damaged or susceptible trees primarily to prevent the spread of insect pests or diseases and promote forest hygiene.

Satisfactory Range Condition

On suitable range, forage condition is at least fair, with stable trend, and allotment is not classified PC (basic resource damage) or PD (other resource damage).

PC (Basic Resource Damage). Allotments will be classified as PC when analysis or evaluation indicates that one or more of the following conditions exist and livestock use on the allotment is or has been a major factor contributing to this condition.

Maximum summer water temperatures are elevated above state Standards or other approved criteria on SMU class I or II streams and this is largely due to the loss of shade-producing vegetation in the allotment.

Management-induced instability exceeds 20 percent of the total miles of stream (SMU classes I-IV) in an allotment.

Gully development of sufficient size to lower the seasonally saturated zone and change the plant community type is occurring.

Soil condition rating on 25 percent or more of Key Areas is rated poor or very poor.

PD (Other Resource Damage). These allotments may or may not have approved allotment management plans (AMP's), but adverse impacts on resources other than the basic soil and water resources are occurring. These impacts are the result of resources management objectives not being met. An allotment will be classified as PD when 10 percent or more of its area meets this criteria. Damage to vegetation is based on use in excess of that planned.

Saturation Density

(Same as tolerance density.) This term relates to the requirement of many wildlife species for living space. This condition is most marked in territorial species. Space is the limiting factor to the further increases of the population density of these species.

Scarp

A steep surface on the undisturbed ground at the edge of a landslide. Caused by movement of slide material away from the undisturbed ground.

Scenic Areas

Places of outstanding or matchless beauty which require special management to preserve these qualities. They may be established under 36 CFR 294.1 whenever lands possessing outstanding or unique natural beauty warrant this classification.

Scheduled Timber Harvest

Timber harvest that is chargeable to the annual allowable sale quantity for the Forest.

Scoping Process

Determining the extent of analysis necessary for an informed decision of a proposed action. The process includes: (1) reviewing present Management direction as it relates to the analysis; (2) contacting those publics interested or affected by the proposed action to get their opinions and surface the issues; (3) determining local management concerns. This process continues throughout analysis until a decision is made.

Second Growth

Forest growth that has come up naturally after some drastic interference with the previous forest growth (e.g., cutting, serious fire, or insect attack).

Secondary User Species

Wildlife that occupies a site (cavity in a snag or a den) created by another species.

Sediment

Solid material, both mineral and organic, that is in suspension, and is being transported from its site of origin by air, water, gravity, or ice, or has come to rest on the earth's surface either above or below sea level.

Seed Tree Cutting

Removing all mature trees from a stand except for selected seed-bearing trees retained on site to provide a seed source for stand regeneration.

Selection Cut

Selection cutting is the periodic removal of mature trees individually or in small groups from an uneven-aged forest. By this method, both regeneration cutting and tending of immature stand components are accomplished at each entry.

Semi-Primitive Motorized ROS Class

See Recreation Opportunity Spectrum.

Semi-Primitive Non-Motorized ROS Class

See Recreation Opportunity Spectrum.

Sensitive Species

Those species of plants or animals that have appeared in the Federal Register as proposed for classification and are under consideration for official listing as endangered or threatened species, that are on an official State list, or that are recognized by the Regional Forester as needing special management to prevent their being placed on Federal or State lists.

Seral

A biotic community which is a developmental, transitory stage in an ecological succession.

Sheet Erosion

The removal of a fairly uniform layer of soil from the land surface by runoff water.

Shelterwood Cutting

Any regeneration cutting in a more or less mature stand designed to establish a new stand under the protection (overhead or side) of the old stand. Usually the shelterwood involves two separate harvest operations. The first harvest (seed cut) is designed to create space and seed production to establish new trees. The second cut (removal cut) is designed to remove the remainder of the old stand before it begins to compete with the new stand for light and nutrients. This is usually within 10 years. (See also Extended Shelterwood).

SHPO

"State Historic Preservation Officer" means the official appointed or designated pursuant to Section 101(b)(1) of the National Historic Preservation Act to administer the State historic preservation program or a representative designated to act for the SHPO. Among other duties, the State Historic Preservation Officer advises and assists Federal agencies and State and local governments and cooperates with these agencies and others to ensure that historic properties are considered at all levels of planing and development.

Significant Disturbance

When natural recovery would not be expected to take place within a reasonable period of time, there is unacceptable air or water degradation; there is unnecessary or unreasonable injury, loss or damage to National Forest resources.

Silvicultural System

A management process whereby forests are tended, harvested, and replaced resulting in a forest of distinctive form. Systems are classified according to the logging method that removes the mature crop and provides for regeneration and according to the type of forest thereby produced. (36 CFR 219.3)

Silviculture

The art and science of growing and tending forest vegetation for specific management goals.

Single-Tree Selection

In uneven-aged management, harvest of scattered individual trees. Cutting is repeated at frequent intervals, but only a few trees are removed each time.

Site Index

A numerical evaluation of the quality of land for plant productivity which uses height growth as a function of age.

Site Preparation

1) An activity (such as prescribed burning, disking, and tilling) performed on a reforestation area, before introduction of reforestation, to ensure adequate survival and growth of the future crop; OR

2) manipulation of the vegetation or soil of an area prior to planting or seeding. The manipulation follows harvest, wildfire, or construction in order to encourage the growth of favored species. Site preparation may include the application of herbicides; burning, or cutting of living vegetation that competes with the favored species; tilling the soil; or burning of organic debris (usually logging slash) that makes planting or seeding difficult.

Site Productivity

Production capability of specific areas of land to produce defined outputs such as AUMs, cubic feet/acre/yr. etc.

Size Class

For purposes of Forest planning, size class refers to the three intervals of tree stem diameter used for classification of timber in the Forest Plan data base:

less than 5" diameter = seedling/sapling

five to 8" diameter = pole timber

greater than 8" diameter = sawtimber

Slash

The wood residue left on the ground after timber cutting and/or accumulating there as a result of storm, fire, or other damage. It includes unused logs, uprooted stumps, broken or uprooted stems, branches, twigs, leaves, bark, and chips.

Slope

An inclined ground surface, the inclination of which is expressed as a ratio of horizontal distance to vertical distance. The face of an embankment or cut section.

Small Game

Birds and small mammals typically hunted or trapped.

Snag

A standing dead tree.

Smolt

A young salmon during it's migration downstream to the sea after hatching.

Socioeconomic

Pertaining to, or signifying the combination or interaction of, social and economic factors.

Soil

The unconsolidated mineral and organic material on the immediate surface of the earth.

Soil Productivity

The capacity of a soil to produce a specified crop such as fiber or forage under defined levels of management. Productivity is generally dependent on available soil moisture and nutrients, and length of growing season.

SOHA

(Spotted Owl Habitat Area.) An area containing the home range of one or more owl pairs established for the propagation and protection of the species in accordance with a management plan.

Sound Wood

Timber that is free from defect, damage, or decay; i.e., in solid, whole, good condition.

Special Emphasis Program Action Plan

A plan that coordinates the efforts of the Special Emphasis Program Managers as they work toward improving employment opportunities and work place conditions for women, persons with disabilities, and persons of Asian, Black, Hispanic and Native American heritage.

Special Emphasis Watersheds

This designation is applied to selected watersheds where special management emphasizes unusually high combinations of riparian resource values and high sensitivity due to generally demanding site conditions and where the goal is to maintain or improve habitat conditions for the sustained, long-term production of fisheries and high quality water.

Special Places

Those places on the Forest that have special meaning to people. These places can range in size and type from roadside campsite of less than an acre, to a Wilderness Area of several thousand acres. People's reasons for emotional attachment to these sites are as varied as the places they feel close to.

Species Richness Management

A wildlife management strategy to maintain viable populations of all resident species.

Stand

Timber possessing uniformity as regards to type, age class, risk class, vigor, size class, and stocking class.

Standard

A principle requiring a specific level of attainment, a rule to measure against.

Standard Service Level

Each developed site is planned to provide a particular mix of services, these planned services become the standard by which the site is operated.

Strategic Minerals

Those minerals of which the U.S. imports 50 percent or more from foreign sources (based on 1978 U.S. Bureau of Mines figures).

Stream Buffer

See Streamside Management Unit.

Stream Channel Morphology

The structure or form of a stream channel, as influenced by processes of erosion and deposition of channel materials (gravel, cobbles, sand, soil, etc.).

Stream Class

Classification of streams based on the present and foreseeable uses made of the water, and the potential effects of on-site changes on downstream uses. Four classes are defined:

Class I - Perennial or intermittent streams that: provide a source of water for domestic use; are used by large numbers of fish for spawning, rearing or mitigation; and/or are major tributaries to other Class I streams.

Class II - Perennial or intermittent streams that: are used by moderate though significant numbers of fish for spawning, rearing or migration; and/or may be tributaries to Class I streams or other Class II streams.

Class III - All other perennial streams not meeting higher class criteria.

Class IV - All other intermittent streams not meeting higher class criteria.

Stream Discharge

The volume of water flowing past a point per unit time, commonly expressed as cubic feet per second, million gallons per day, gallons per minute or cubic meters per second.

Stream Scour or Channel Scour

Erosion of the channel bottom and/or banks caused by high flows or water, loss of channel stability, or debris torrents.

Stream Structure

The arrangement of logs, boulders, and meanders which modify the flow of water, thereby causing the formation of pools and gravel bars in streams. Generally, there is a direct relationship between complexity of structure and fish habitat. Complex structure is also an indication of watershed stability.

Streamflow

The flow of water, generally with its suspended sediment load, down a well-defined watercourse.

Streamside Management Unit (SMU)

An area of varying width adjacent to a stream where practices that might affect water quality, fish, and other aquatic resources are modified to meet water quality goals, for each class of stream. The width of this area will vary with the management goals for each class of stream, the characteristics of the stream and surrounding terrain, and the type and extent of the planned activity.

Successional Stage

A stage or recognizable condition of a plant community that occurs during its development from bare ground to climax. For example, coniferous forests in the Blue Mountains progress through six recognized stages: grass-forb; shrub-seedling; pole-sapling; young; mature; old growth.

Suitability

The appropriateness of applying certain resource management practices to a particular area of land, as determined by an analysis of the economic and environmental consequences and the alternative uses foregone. A unit of land may be suitable for a variety of individual or combined management practices. (36 CFR 219.3)

Suitable Range

Land that is accessible or that can become accessible to livestock; that produces forage or has inherent forage producing capabilities; and that can be grazed on a sustained yield basis under reasonable management goals. Suitable range includes both rangeland and forest land with a grazable understory which are contained in grazing allotments.

Supply

The amount of an output that producers are willing to provide at a specific price, time period, and condition of sale.

Suppression

The action of extinguishing or confining a fire.

Surface Resources

Renewable resources located on the earth's surface in contrast to ground water and mineral resources located below the earth's surface.

Surface Runoff

Water that flows over the ground surface and into streams and rivers.

Sustained Yield of Products and Services

The achievement and maintenance in perpetuity of a high-level annual or regular periodic output of the various renewable resources of the National Forest System without impairment of the productivity of the land. (36 CFR 219.3)

T

Targets

Output accomplishments assigned to the Forest by the Forest Service Regional Forester. A statement used to express planned results to be achieved within a stated period of time.

Temporary Roads

Localized roads of limited duration, typically available for generic forest activities during the life of the project for which the road was constructed.

Tentatively Suitable Forest Land

Forest land that is producing or is capable of producing crops of industrial wood and: (a) has not been withdrawn by Congress, the Secretary, or the Chief; (b) existing technology and knowledge is available to ensure timber production without irreversible damage to soils productivity, or watershed conditions; (c) existing technology and knowledge, as reflected in current research and experience, provides reasonable assurance that it is possible to restock adequately within five years after final harvest; and (d) adequate information is available to project responses to timber management activities.

Terrestrial Habitat

Land area; wildlife species that dwell primarily on land, not aquatic, arboreal or aerial.

Thermal Cover

Cover used by animals to lessen the effects of weather; for elk, a stand of coniferous trees 12 meters (40 feet) or more tall with an average crown closure of 70 percent or more; for deer, cover may include saplings, shrubs, or trees at least 1.5 meters (5 feet tall) with 75 percent crown closure.

Thermal Gradient

The rate of change in heat, or temperature, of the earths crust as you get deeper in the earth. Usually obtained from drill core sampling. Often the thermal gradient is used in analysis of an areas potential for geothermal energy development.

Threatened Species

Any species of animal or plant which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range and which has been designated in the Federal Register by the Secretary of Interior as a threatened species.

Tiering

The coverage of general matters in broader environmental impact statements with subsequent, narrower statements or environmental analyses incorporating by reference the general discussions and concentrating solely on the issues specific to the statement subsequently prepared. Tiering is appropriate when the sequence of statements or analyses is:

(a) from a program, plan, or policy environmental impact statement to a program, plan, or policy statement or analysis of lesser scope to a site-specific statement or analysis.

(b) from an environmental impact statement on a specific action at an early stage to a supplement or a subsequent statement or analysis at a later stage. Tiering is such cases is appropriate when it helps the lead agency to focus on the issues which are already ripe for decision and exclude from consideration issues already decided or not yet ripe.

Timber Classification

Forest land is classified under each of the land management alternatives according to how it relates to the management of the timber resource. The following are definitions of timber classifications used for this purpose.

Nonforest. Land that has never supported forests and land formerly forested where use for timber production is precluded by development or other uses.

Forest. Land at least 10-percent stocked (based on crown cover) by forest trees of any size, or formerly having had such tree cover and not currently developed for nonforest use.

Suitable. Commercial forest land identified as appropriate for timber production in the Forest planning process.

Unsuitable. Forest land withdrawn from timber utilization by statute or administrative regulation (for example, wilderness), or identified as not appropriate for timber production in the Forest planning process.

Commercial Forest. Forest land tentatively suitable for the production of continuous crops of timber and that has not been withdrawn from timber utilization.

Timber Production

The purposeful growing, tending, harvesting, and regeneration of regulated crops of trees to be cut into logs, bolts, or other round sections for industrial or consumer use. For planning purposes, the term "timber production" does not include production of fuelwood (36 CFR 219.3)

Timber Sale Program Quantity (TSPQ)

The volume of timber planned for sale during the first decade of the planning horizon. It includes the allowable sale quantity (chargeable volume) and any additional material (nonchargeable volume) planned for sale. Expressed as the average for the first decade.

Timber Stand Improvement (TSI)

The elimination or suppression of the less desirable vegetation in favor of the more desirable tree growth. It includes thinning, cleaning, weeding, and release cuttings.

Toe

The lower, usually curved, margin of the disturbed material of a landslide pushed over onto the disturbed slope.

Tolerant Species

Plants that grow well in shade.

Trail Sensitivity

Sensitivity Level I have prescribed VQOs of retention, partial retention and modification in near-foreground, far-foreground and middleground distance zones respectively.

Sensitivity Level II trails have prescribed VQOs of partial retention modification in near-foreground, far-foreground and middleground distance zones.

Sensitivity Level III trails shall have a prescribed VQO of modification for all distance zones.

Transistory Range

Land that is suitable for grazing use of a nonenduring nature over a period of time. For example, on particular disturbed lands, grass may cover the area for a period of time before being replaced by trees or shrubs not suitable for forage.

Turbidity

The degree of opaqueness, or cloudiness, produced in water by suspended particulate matter, either organic or inorganic. Measured by light filtration or transmission and expressed in Jackson Turbidity Units (JTU).

Twenty-Five Percent Fund Act of 1908

This act provided that twenty-five percent of all moneys received during any fiscal year from each national forest shall be paid, at the end of each year, by the Secretary of the Treasury to the state in which each national forest is located. This money goes to the counties based on the proportion of the national forest in the respective counties. This payment is in addition to the payments in lieu of taxes made under the Payment in Lieu of Taxes Act of 1976.

U

Uncertainty

Whenever a variety of outcomes are possible and a probability of any specific outcome cannot be assigned with any degree of accuracy.

Understory

Vegetation growing under a higher canopy.

Uneven-Aged Management

The application of a combination of actions needed to simultaneously maintain continuous high forest cover, recurring regeneration of desirable species, and the orderly growth and development of trees through a range of diameter or age classes. This management must provide a sustained yield of forest products. Cutting is usually regulated by specifying the number or proportion of trees of particular sizes to retain within each area, thereby maintaining a planned distribution of size classes. Cutting methods that develop and maintain uneven-aged stands are single-tree selection and group selection. (36 CFR 219.3)

Uneven-Aged Silviculture Systems

The combination of actions that result in the creation of forests or stands of trees, in which trees of several or many ages grow together. Cutting methods that develop and maintain uneven-aged stands are single tree and group selecting cutting methods:

Single Tree Selection Cutting. The removal of selected trees of all size classes on an individual basis.

Group Selection Cutting. The removal of all trees in groups for regeneration purposes. The size of the group will be small enough in area that all subsequent regeneration will be influenced by the surrounding uncut stand. Cuts are generally .25 - 2.0 acres in size.

Uniform Flow

A state of steady water flow where the mean velocity and cross sectional area are equal at all sections.

Unroaded Acres

Those areas of undeveloped Federal land within which there are no improved roads maintained for travel by means of vehicles intended for highway use.

Utilization Standards

Standards guiding the use and removal of timber which is measured in terms of diameter at breast height (d.b.h.), top diameter inside the bark (top d.i.b.), and percent "soundness" of the wood.

Unplanned Ignition

A fire started at random by either natural or human caused, or a deliberate incendiary fire.

Unregulated Timber Management

Timber cut from those lands that are not organized to provide sustained yields of timber.

Unsatisfactory Range Condition

Allotment does not meet criteria for satisfactory condition.

Utility and Transportation Corridors

A strip of land designated for the transportation of energy, commodities, and communications by railroad, state highway, electrical power transmission (69 KV and above), oil and gas and coal slurry pipelines 10 inches in diameter and larger, and telecommunication cable and electronic sites for interstate use. Transportation of minor amounts of power for short distances, such as short feeder lines from small power projects including geothermal or wind, or to serve customer subservice substations along the line, are not to be treated within the Forest Plan effort.

V

Value Analysis

A systematic approach to analyzing the function of an item or system to achieve the required results at a minimum total cost consistent with planned objectives.

Value, Market

The unit price of an output normally exchanged in a market after at least one stage of production, expressed in terms of what people are willing to pay as evidenced by market transactions.

Value, Nonmarket

The unit price of an output not normally exchanged in any market at any stage before consumption, and thus must be imputed from other economic information.

Variety Class

A classification system for establishing three visual landscape categories according to the relative importance of the visual features.

Viewshed

The total landscape seen or potentially seen from all or a logical part of a travel route, use area, or water body.

Primary Viewshed The landscape seen from a designated travel route, or designated use area, which has high volume of use, long duration of use, or is a major access to the Forest. The same as Level I Sensitivity to scenic quality.

Secondary Viewshed The landscape seen from a designated travel route, or designated use area, with low use volume, short use duration, or is a minor access route to the Forest. Same as Level II Sensitivity to scenic quality.

Visitor Information Service (VIS)

Activities which interpret for visitors, in layman's language, Forest management, protection, utilization, and research. It also includes interpretation of local botany, geology, ecology, zoology, history, and archaeology.

Visual Condition

The visual appearance of a landscape described in terms of the degree of alteration of the natural appearing landscape. These terms are normally used as a summary rating for a large land area, such as a viewshed corridor. Descriptive degrees of alteration are:

Natural Appearing. Area appears untouched by man; changes are not visually evident. Generally similar to the Retention VQO.

Slightly Altered. Changes may be noticed by the average visitor but do not attract attention. Natural appearance dominates minor disturbances. Generally similar to the Partial Retention VQO.

Moderately Altered. Changes are easily noticed by the average visitor and may attract attention. Disturbances are apparent. Generally similar to the Modification VQO.

Heavily Altered. Changes are strong and obvious to the average visitor. Changes dominate the landscape but may resemble natural patterns when viewed from a distance of 3 to 5 miles. Disturbances are major. Generally similar to the Maximum Modification VQO.

Visual Management System

The management system used to protect and enhance the visual resource.

Visual Quality Objectives (VQO)

Categories of acceptable landscape alteration measured in degrees of deviation from the natural-appearing landscape.

Preservation (P) - Ecological changes only.

Retention (R) - Management activities should not be evident to the casual Forest visitor.

Partial Retention (PR) - Management activities remain visually subordinate to the characteristic landscape.

Modification (M) - Management activities may dominate the characteristic landscape but must, at the same time, follow naturally established form, line, color, and texture. It should appear as a natural occurrence when viewed in foreground or middleground.

Maximum Modification (MM) - Human activity may dominate the characteristic landscape, but should appear as a natural occurrence when viewed as background.

Enhancement - A short-term management alternative which is done with the express purpose of increasing positive visual variety where little variety now exists.

Visual Resource (Forest Scenery)

The composite of basic terrain, geologic features, water features, vegetative patterns, and land-use effects that typify a land unit and influence the visual appeal the unit may have for visitors. Visual resource categories include Retention (R), Partial Retention (PR), and Modification (M).

VQO

An abbreviation of visual quality objective.

W

Water Quality

The biological, physical, and chemical properties of water that make it suitable for given specified uses. Definition of water quality for forest areas is difficult because of the wide range of downstream uses.

Water Yield

The measured output of the Forest's streams.

Watershed

The line separating head-streams which flow to different river systems; it may be sharply defined (crest of a ridge), or indeterminate (in a low undulating area).

Watershed Impact Area

Areas within a watershed which are being hydrologically disturbed by management activities (timber harvest, road construction, etc.) or natural disturbances (wildfire, landslides, etc.). Such areas may adversely affect the hydrologic equilibrium of a watershed by increasing peak flows or decreasing watershed or channel stability. Impact areas are limited to a percent of the total watershed area by Standards and Guidelines in Chapter 4 of the Forest Plan.

Wetlands

Areas that are inundated by surface or ground water with a frequency sufficient to support a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. (Executive Order 11990.) Under normal circumstances the area does or would support a prevalence of vegetative or aquatic life.

WFUDs

An abbreviation of Wildlife and Fish User Days.

Wild and Scenic Rivers

Those rivers or sections of rivers designated as such by congressional action under the 1968 Wild and Scenic Rivers Act, as supplemented and amended, or those sections of rivers designated as wild, scenic, or recreational by an act of the Legislature of the State or States through which they flow. Wild and scenic rivers may be classified and administered under one or more of the following categories:

Wild River Areas. Those rivers or sections of rivers that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted These represent vestiges of primitive America.

Scenic River Areas. Those rivers or sections of rivers that are free of impoundments, with watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads.

Recreational River Areas. 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.

Wilderness

Areas designated by congressional action under the 1964 Wilderness Act. Wilderness is defined as undeveloped Federal land retaining its primeval character and influence without permanent improvements or human habitation. Wilderness areas are protected and managed to preserve their natural conditions, which generally appear to have been affected primarily by the forces of nature, with the imprint of human activity substantially unnoticeable have outstanding opportunities for solitude or for a primtive and unconfined type of recreation; include at least 5,000 acres or are of sufficient size to make practical their preservation, enjoyment, and use in an unimpaired condition; and may contain features of scientific, educational, scenic, or historical value as well as ecologic and geologic interest.

Wilderness Resource Spectrum (WRS)

Standard and guidelines for managing Wilderness within the nondegradation policy have been developed under the Wilderness Resource Spectrum (WRS) concept. In the Pacific Northwest Region, the WRS classification system has been adopted to establish a variety of settings to meet Wilderness management and should not be confused with the Recreation Opportunity Spectrum; classification system. WRS classifications are determined by measured criteria which describe the social, biological, and physical characteristics of the area. Three primary zones are:

Primitive Trailless. This zone offers the maximum possible solitary Wilderness experience. To qualify for this designation, the zone must be large enough to allow at least two days of cross-country travel without crossing a constructed trail. No more than one encounter with another user may be expected. The Forest does not contain this class of Wilderness zone.

Primitive Trailed. This zone offers the most solitary experience to be found on the Forest. The only facilities permitted are those needed to protect the environment. In practice, this means the presence of trails and a limited number of signs only. A user amy expect to encounter no more than six other parties per day during 80% of the use season.

Semi-Primitive Trailed. This zone offers somewhat less solitary Wilderness experience than the Primitive Trailed. Activities to control degradation of the ecological and social values of the Wilderness are evident. Limited development, including toilets, are permitted. The number of encounters with other users is not expected to exceed 12 parties per day during 80% of the season.

Transition. In this zone encounters with other users in some areas exceed those specified for the Semi-Primitive Trailed zone making it desirable to identify areas where the heaviest use of the Wilderness takes place. Higher intensities of Mangement activity in a Transition Zone are evident. More signs are in the zone, and trails may be constructed to higher standards. Encounters with other users is expected to be 18 or less per day during 80% of the season.

Wilderness Values

Those social and/or biological values, or combination of that are generally only provided by the Wilderness Resource; for example, natural operating ecological processes, outstanding opportunities for solitude and primitive recreation, and freely operating wildlife populations.

Wildfire

Any wildland fire not designated and managed as a prescribed fire within an approved prescription.

Wildlife and Fish User Day (WFUD)

One WFUD consists of 12 hours of recreation use that is the result of fish or wildlife resources.

Winter Range

The area available to and used by big game through the winter season.

Withdrawal

An order removing specific land areas from availability for certain uses.

Woody Material

Large logs necessary for stream channel stability and maintenance of watershed condition.

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