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Appendices A - I
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

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Public Issue, Management Concern and Opportunity Development Process

Appendix A

Public Issue, Management Concern, and Opportunity Development Process

Appendix A - Public Issue, Management Concern and Opportunity Development Process

Introduction

This appendix displays the process used to identify public issues, management concerns, and resource use and development opportunities. Included in this discussion is a list of the criteria use to screen the issues and concerns. The current Public issues are classified into those which are deferred for resolution outside the forest planning process, those which are treated the same way in all alternatives, and those treated differently in the design of various alternatives. The Forest's potential capability to respond to each Public Issue is described. Also included are contacts and consultation with others throughout the planning effort. These "others" include governmental agencies, Native American Tribes, interest groups and individuals.

Public Issue, Management Concern, and Resource Use and Development Opportunity Identification Process

Identification Process - 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).

The identification of ICOs for consideration in the Forest planning process began in November 1979. At that time, the Forest Interdisciplinary Planning Team (IDT) compiled a preliminary set of ICOs. This process drew upon information gathered in previous planning efforts as well as from discussions with Forest Service employees.

This 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 Supervisor's Office, Gresham, Oregon.
- November 29, 1979, at the Hood River Inn, Hood River, Oregon.

Other 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.

Screening Process

A screening process was developed to aid in the review of the public responses received. The intent was to develop a concise but comprehensive list of ICOs which would lead to effective analysis and informed decisions. The preliminary set of ICOs and public responses relating to the development of ICOs were reviewed using the following criteria. The objective of this review was to determine which preliminary ICOs could or should be addressed in the Forest Planning Process. The resulting list of public issues, management concerns, and resource opportunities became the building blocks of the Mt. Hood EIS and Forest Plan.

First Screening Criteria

- Is the topic within authority of the Forest Service?
- Is the topic already covered by existing laws, regulations or executive orders?
- Can the topic affect or be affected by existing programs or management direction?

Second Screening Criteria (Issue Format)

- Is the topic encompassing enough so that related facets are in one issue but narrow enough so they can be handled as one?
- Is the topic controversial enough so there is something to resolve but moderate enough so they can be resolved?

Third Screening Criteria

- Scope: Is the geographical area involved appropriate for consideration.
- Duration: Is the time required to resolve the issue within the planning horizon.
- Intensity: Is the issue representative of more than an isolated case.

All of the comments and suggestions were carefully considered using the criteria shown above. Application of the screens resulted in items being combined, modified, or in some cases eliminated as not appropriate to Forest Planning. Many suggestions were carried forward with little or no modifications. A composite list was formulated and sent to the Regional Forester for review. This list was approved by the Regional Office in June of 1980. It was this list which helped the Forest determine which data would be collected, the depth of analysis needed, and what standards would be used to ensure sound analytical procedures were followed.

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 result of changes in policy and procedures, some of the issues have been modified. It is around this revised set of issues that the alternatives contained in the Draft EIS were designed and analyzed.

In March of 1984, the Regional Office requested that the Forest reformat the lists of Issues, Concerns, and Opportunities. Before submitting the reformatted ICOs, the Forest Planning team reviewed the list approved in 1980. Because new situations developed, based on changes in technology, the economy, trends, and public interest, some modifications were necessary. As a result, some Public Issues and concerns were added to the 1980 list, some deleted, and new opportunities identified. The new subjects were concerned with economics of the timber sale program, roadless areas, fisheries, cultural sites, noxious weed control, developed recreation, earthflows and availability of resources traditionally used by Native Americans. One issue which dealt with location and in-

tensity of managed fire areas was removed from the list as it was no longer considered valid due to improved understanding of current fire management. The revised list was sent to the Regional Forester in September of 1984.

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 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. 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 "preferred alternative" in the Forest Plan. Management concerns and resource opportunities are also addressed through the development of Standards and Guidelines. 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.

Current Issues, Concerns, and Opportunities

List of Public Issues

The twelve Public Issues listed below were identified through the process described above. Chapter I of the accompanying FEIS presents a detailed discussion of the Public Issues which includes indicators of responsiveness and changes from Draft to Final.

- ☐ Level of Timber Supply on the Mt. Hood National Forest
- ☐ Community Stability
- ☐ Maintenance and Distribution of Old Growth
- ☐ Viable Populations of Spotted Owls and Management Indicator Species
- ☐ Conflicts Between Management Activities and Competing Recreational Activities
- ☐ Maintenance and Enhancement of Scenic Quality
- ☐ Disposition of the Remaining Roadless Areas
- ☐ Diminishing Supply, or Availability, of Resources Traditionally Used in Native American Religious and Cultural Life
- ☐ Maintenance and Rehabilitation of Fish Habitat and Water Quality
- ☐ The Supply of Developed Recreation Site Opportunities
- ☐ Wild, Scenic, and Recreational Rivers
- ☐ Deer and Elk Management

Issues Addressed in the Draft EIS, But Not Receiving Detailed Analysis in This FEIS

- Use of chemicals in the management of forest vegetation. The Forest will follow the direction for use of chemicals, which was established in the Pacific Northwest Region (R6) "Managing Competing and Unwanted Vegetation" FEIS, Record of Decision (1988), and Mediated Agreement (1989).
- Forest users have reached or exceeded the capacity of existing public highways in or near the Mt. Hood Forest during heavy use periods. The Forest will continue to coordinate with the Oregon Department of Transportation to develop solutions to this problem.
- Level of ski area development. This issue is discussed on a site by site basis and in separate Environmental Impact Statements.

Management Concerns

The list of Management Concerns has been updated to respond to new concerns expressed.

- Allocations to other resources and constraints on commercial timber harvest may prevent Mt. Hood National Forest from meeting its' share of national needs for wood and wood products, as expressed in RPA targets.

- Availability of Firewood for Public and Commercial Cutting.
- Protection of the cultural resource values of National Register properties may constrain management activities (including Commercial Timber Harvest) involving the land within or adjacent to National Register property boundaries.
- Procedures to Protect Threatened and Endangered Species. A policy for handling protection of plants and allocations for threatened and endangered wildlife species (spotted owls, etc.) is needed.
- The need to provide an adequate spatial and temporal distribution of key habitats including those for indicator wildlife and plant species (i.e., seasonal ranges, dead and defective trees, old growth, wetlands and riparian habitat, and harassment potential), interconnected with dispersion corridors.
- Noxious Weed Control. Controlling the eastward spread of Tansy Ragwort and other noxious weeds has become a concern.
- Maintenance of High Quality Water from Forest Lands for Domestic Water Supplies.
- Maintenance of Minimum Flows and Hydrologic Balances and the Re-establishment of Recovery Rates Following Timber Harvest Activities.
- Timber harvest and other management activities may cause unacceptable soil movement and impact soil productivity.
- Managing Wilderness in Proximity to Urban Area while Maintaining consistency with the Wilderness Act. The intense heavy use of Wilderness on the Forest is causing resource damage and creating recreation experiences that are inconsistent with the intent of Wilderness.
- The Ability to Meet Existing and Future Demand for Developed Recreation, and Dispersed Recreation (especially the demand for roadless, or back country, non-motorized dispersed recreation including trail hiking), especially near Urban Areas.
- Timing of Fuel Management Projects.
- Future Availability of an Adequate Supply of Rock for Use On and Off the Forest.
- Accumulated impacts of timber harvest and other management activities on land stability within large slow moving earthflows.
- Accelerating Demand for Nonforest Land Uses. Continued urbanization of the Mt. Hood corridor and urban development near Forest boundaries will increase requests for services on National Forest lands.
- Decreasing supply of old growth stands. There has been increasing public concern for maintaining old growth forests for a variety of reasons, these include biological diversity, recreation, and aesthetics.
- Development of Management Direction that Allows for Exploration and Possible Development of All Existing and Potential Mineral and Energy Mineral Resources, while Protecting Land Productivity and Other Resources.
- Development of Management Direction that allows for Small Hydroelectric Development and Other Sources of Energy (Wind, Biomass, etc.), while Protecting Land Productivity and Other Resources.
- Scenic Quality. Viewing scenery is the most popular recreational use of the Forest. Deterioration of visual quality is a concern.
- New Perspectives in Forestry. Incorporate considerations for "New Perspectives in Forestry" issues, such as Fragmentation and Biological Diversity.

Resource Use and Development Opportunities

The opportunity to preserve or develop and use the resources of the National Forest is the focus of many of the Forest's programs. The list of Opportunities has been updated to respond to new opportunities expressed.

Timber/Silviculture

- Make the residue from timber harvest operations available for firewood and other wood fiber uses whenever possible.
- Take advantage of opportunities to offset losses or increase yields in timber supply:
  - Genetically improved stocking.

  - Fertilization.
  - Commercial and precommercial thinning.
  - Silvicultural practices to decrease insect and disease losses.
- Stocking level control, cleaning, weeding, and other early stand manipulation.
- Develop and implement a full range of silvicultural systems including uneven aged management.
- Implement current technology (Geographic Information Systems) to address fragmentation of extensive forested areas.

Transportation

- Incorporate consideration for all other resources into the design of all new Forest Transportation Roads, and accommodate other resource needs in the re-design and reconstruction and/or maintenance of Forest roads.
- Develop a system of recreational trails that interconnect with other agency, private (State, BLM) and particularly metro-area trails. Incorporate trails such as the Clackamas River Trail and historic travel routes such as the Barlow Road and the historic "Indian Ridge" Route (from Silver Falls to the Pacific Crest Trail).
- Develop additional recreation trails within the Forest by incorporating remaining segments of older, abandoned, historic and non-maintained trails.
- Revise and complete the 1966 Barlow Road Management Plan and develop the Barlow Road as a hiking and horse trail from Barlow Pass west to Tollgate Campground in accordance with the Oregon Trail Comprehensive Management and Use Plan.
- Develop and implement a Substantial & Comprehensive Long-Term Capital Investment Program to Correct Fish Passage Blockages and Offset Decline or Losses in Fish Habitat due to Road Construction and/or Location.

Plant and Animal Communities

- Use vegetative management to maintain or improve representative habitat throughout the Forest.

Recreation

- Provide additional recreational opportunities such as dispersed campsites, trail heads and parking, fishing access, quality hunting areas, wildlife viewing, scenic viewpoints and other dispersed recreation activities.
- Maintain quality of existing scenery and rehabilitate degraded scenic viewsheds.
- Provide additional opportunities for dispersed winter recreation such as development of winter parking and snow play areas, and designation and marking of winter road and trail routes for snowmobiling and Nordic skiing.
- Utilize investment opportunities in response to shifting recreation uses:
  - Reconstruction and improvement of existing sites and trails.
  - Construction of inventoried sites and trails.
  - Provide new and upgrade day use facilities.
  - Improve trail maintenance.
  - Consider hazard ratings for disease and insects in determining potential recreation sites.
- Develop more interpretive sites, particularly historic sites, and expand informational systems used to convey recreational opportunity information to the public.

Fire and Fuels

- Develop programs using prescribed fire to maintain existing meadows within the Forest.
- Use underburn opportunities, where applicable, to achieve long term fire and fuels management goals, meet silvicultural goals and to benefit wildlife and range habitat.

Soils/Watershed

- Rehabilitation of heavily impacted lands and damaged sites to restore long term site productivity.

Social

- Encourage the development of partnership arrangements. Promote and make available areas and services to users of urban outreach programs.

Fisheries/Wildlife

- Implementation of a comprehensive, long-term program to rehabilitate and enhance anadromous and resident fish and wildlife habitat.
- Implement the National initiatives and partnerships relating to wildlife/fisheries recovery and education efforts.

Ability to Resolve and Indicators of Responsiveness for Public Issues

The resolutions of these issues are of vital interest to the public and to land managers. The Forest's ability to resolve the issues is a product of the capability of the land, the applications of selected management practices to produce or maintain effects, the timing of practices and the budget to implement them. The Public Issues and their different elements were analyzed to determine how they could best be resolved. Three possible approaches to the resolution of the Public Issues are:

- Deferring resolution outside the forest planning process.
- Developing appropriate Standards and Guidelines that would satisfy the concerns and resolve the issue. This approach addresses the issue in the same way for each alternative.
- Treating the issue differently in various alternatives and measuring the effects to provide the basis for identifying the alternative which best resolves the issue.

The first method is appropriate for issues that are, or will be, dealt with in separate environmental (NEPA) documents and subsequent decisions. The second method is appropriate for issues that do not involve land allocation or scheduling decisions, or where choices do not exist. Where this is not the case, the issues are best addressed by using the third method, i.e., developing various alternatives which provide choices about the provision of various quantities of each resource over time. Often resolution can best be reached by using both methods two and three.

Each Public Issue is discussed in three parts:

- The Situation
- Ability to resolve the issue
- Indicators of responsiveness to the issue

Most of the Public Issues are related to each other. The situation section will describe relationships between resources, both within issues and between issues. Also included is a discussion of the Forest's ability to resolve the issues. Indicators of responsiveness are used to evaluate the alternatives and to subsequently select a preferred alternative for the Forest Plan. The indicators of responsiveness are discussed in more detail in FEIS Chapter I.

Issues Addressed Differently by Each Alternative

Level of timber supply on the Mt. Hood National Forest

Situation

There is a divergence of public opinion on this issue. Many individuals have urged the Forest to help sustain regional and local economies by; maintaining or increasing annual timber harvests, conserving the forest land base suitable for timber production, and using intensive timber management practices to maximize timber yields. These individuals favor the direct economic benefits of timber harvesting more strongly than the amenity values provided by the Forest.

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.

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.

Perhaps more than any other public issue this one affects and is affected by the resolution of other resource issues. As stated above, timber harvesting may affect fish habitat, older forest wildlife habitat, soils, water quality, unroaded recreation, and scenic quality. The most significant effect of other resources uses on timber is the classification of land as nonsuitable for timber management. Managing for nontimber resources may reduce the number of acres available for intensive timber management.

Ability to Resolve

The ability to resolve this issue is, in part, based upon the amount of land suitable for timber production, the amount of volume that the land is physically capable of producing, and the other resource objectives that must be met.

Land Allocations provide the primary means of addressing this issue. Alternatives were developed that explored different ways of producing high volumes of timber. Alternatives vary on the number of acres designated to intensive timber harvest.

Another approach which was analyzed was to increase annual timber offerings by departing from a non-declining flow level of harvest. This would increase sell levels for a period of time after which the levels would fall below the even-flow level.

Indicators of Responsiveness

The extent to which the alternatives are responsive to this issue can be evaluated by the following:

- Average Annual, First Decade Allowable Sale Quantity (ASQ).
- Timber Sale Program Quantity (TSPQ).
- Long-Term Sustained Yield Capacity (LTSYC).

Community Stability

Situation

Forest management affects the jobs, incomes, and life-styles of local residents in nearby communities through economic ties. Forest outputs have traditionally provided a base for the local forest products industry. Small communities near the Forest, especially those on the east side of the Forest, are most affected. These communities are concerned about jobs, timber harvest commodity receipts, and the payments made to their communities in lieu of taxes. There is a concern that the Forest supply timber for local industries to sustain jobs and life-styles.

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

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.

This issue is closely tied to the level of timber harvests on the forest. As with the timber supply issue, this issue involves trade-off's between commodity and amenity resources.

Ability to Resolve

The Forest has attempted to resolve this issue mainly through differing land allocations tied to each of the alternatives. Alternatives explore the effect on local communities of different mixes of Forest output activities. Some alternatives provide high levels of timber to support jobs dependent on the lumber and wood products industries and to maintain payments to counties. Some alternatives provide high levels of recreation, visual quality, and wildlife and fish habitat to support jobs and life-styles dependent on tourism, aesthetics, and recreational use of the Forest.

As with the timber supply issue, one possibility for addressing this issue is to increase annual timber offerings by departing from a non-declining even-flow level of harvest.

Indicators of Responsiveness

The extent to which the alternatives are responsive to this issue can be evaluated by the following:

- Average annual payments to counties within the influence area.
- Change in jobs.

Maintenance and Distribution of Old Growth

Situation

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 it's ecological diversity, recreation, scientific, wildlife habitat, and aesthetic qualities. Many believe that old growth forests are declining too rapidly, because of timber harvest rates that exceed a sustainable level.

Others value old growth as a source of timber. They contend 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.

The old growth issue is interrelated with several other issues. Protecting old growth would reduce the volume available for timber harvest. On the other hand, the harvest of old growth reduces the amenity values associated with old growth such as; fish habitat, old growth wildlife habitat, soils, water quality, unroaded recreation, and scenic quality. Specifically, the harvest of old growth can reduce habitat for the threatened northern spotted owl.

Ability to Resolve

Alternatives vary in the level of old growth to be maintained. These range from retention of all remaining old growth to only the level needed to maintain viable populations of dependent species.

Standards and Guidelines can constrain activities to meet old growth habitat needs. An example of this is Standards which restrict cutting firewood in old growth areas.

Indicators of Responsiveness

The extent to which the alternatives are responsive to this issue can be evaluated by the following:

- Acres of old growth remaining by decade for 50 years.

Viable Populations of Spotted Owls and Management Indicator Species (MIS)

Situation

The controversy in this issue is not the desirability of maintaining diverse and healthy populations, but the management actions needed to accomplish this objective. Management activities such as timber harvest can change the character of the habitat and it's ability to provide for various species. The problem is to identify the appropriate level of habitats that should be maintained, and the acceptable level of effect on timber production resulting from wildlife management activities.

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 effect 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 MIS 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 can 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.

Protection of wildlife habitat may benefit other resources such as water quality, scenic quality, supply of resources used by Native Americans, and provision of old growth.

Ability to Resolve

Habitat for viable populations of spotted owls and other MIS is provided by specifying the condition, size, and distribution of vegetational units.

Attempts to resolve this issue involve land allocations and management direction (Standards and Guidelines).

Where different uses are not compatible, land use designation is necessary. The amount and distribution of suitable habitat is designated through land allocation. Alternatives vary in the number of acres allocated for spotted owl and MIS management.

Management direction which sets standards for timber harvesting and other resource management activities will often protect sensitive areas while permitting logging or road construction. Standards aimed at habitat maintenance and rehabilitation can often help improve the wildlife resource.

Indicators of Responsiveness

The extent to which the alternatives are responsive to this issue can be evaluated by the following:

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

Conflicts Between Management Activities And Competing Recreational Activities

Situation

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 semi-primitive unroaded recreational experiences.

The potential for conflict also exists between different type of recreational uses. Semi-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 are provided for or do not conflict with recreational activities. Others are concerned that the effect of providing recreational experiences, in terms of reduced timber harvest, and the subsequent effects on the economic stability of nearby communities, may be unacceptable.

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 allocation.

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 semi-primitive recreational experiences may also benefit various species of wildlife.

There are some recreation opportunities which 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.

Ability to Resolve

This issue can be addressed mainly through land allocations and management direction. The number of acres identified as being managed for dispersed recreation, visual, and unroaded values can help lead to resolution. Also, specific management direction may be incorporated into the other resource Standards to reduce conflicts where activities overlap.

Indicators of Responsiveness

The extent to which the alternatives are responsive to this issue can be evaluated by the following:

- Supply and demand of dispersed recreation opportunity spectrum (ROS classes) by decade expressed in RVDs (Recreation Visitor Days).

Maintenance and Enhancement of Scenic Quality

Situation

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 impacts of visual resource management on other Forest activities. Particular impacts include reductions in timber harvests and associated costs of implementing visual management activities.

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.

Many of the recreational visitors to the Forest have expressed considerable concern for it's 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.

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 effects of implementing visual management objectives.

Provision of scenic quality may also benefit fish and wildlife habitat and water quality.

Ability to Resolve

This issue can be addressed through land allocations and management direction. The allocation of lands as viewsheds or other allocations which do not degrade the visual quality are a way in which the Forest can respond to this issue. Forest wide Standards for visual quality as well as management direction for other resources can direct management activities to maintain scenic quality.

Indicators of Responsiveness

The extent to which the alternatives are responsive to this issue can be evaluated by the following:

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

Disposition of the Remaining Roadless Areas

Situation

The thrust of this issue is whether these areas should remain roadless. There is a concern that if the areas were to be developed, a wide assortment of resources (ranging from wildlife habitat to recreation opportunities) would be lost. Others are concerned that, because the Oregon Wilderness Act of 1984 released these lands for multiple use management, they should be roaded and harvested.

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 semi-primitive recreation, old growth, and retains options for future land use decisions.

Ability to Resolve

The main option for responding to this issue is land allocations. In the various alternatives, a range of management activities, from maintaining all of the roadless areas in a roadless condition to maintaining none roadless, has been explored.

Indicators of Responsiveness

The extent to which the alternatives are responsive to this issue can be evaluated by the following:

- 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.

Maintenance and Rehabilitation of Fish Habitat and Water Quality

Situation

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 the associated riparian areas. There is a concern that the

Forest should take action to lessen impacts to watersheds and riparian areas.

Due to the generally even 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. Those 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. Those activities which can and sometimes do disturb the ground, 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. For these activities, special precautions are often necessary to reduce or eliminate detrimental effects to aquatic resources.

Ability to Resolve

This issue is addressed mainly through land allocations and management direction. This is reflected by the amount and distribution of areas selected for riparian and watershed management as opposed to the number of acres designated for ground disturbing management activities, such as timber harvests. Standards and Guidelines can direct levels of habitat rehabilitation or enhancement work and can reduce impacts from management activities.

Indicators of Responsiveness

The extent to which the alternatives are responsive to this issue can be evaluated by the following:

- Aquatic Habitat Stability Index.
- Acres explicitly managed to meet riparian objectives.

The Supply of Developed Recreation Site Opportunities

Situation

There is a concern that the supply of developed recreation sites is not keeping up with increasing recreational use. Facilities and vegetation in some developed sites, such as highly used campgrounds, are deteriorating. This deterioration is due to the low level of funding of site maintenance. Some sites have been closed and many facilities are in poor condition.

The supply of new developed recreation sites is related to other resources, such as cultural resources and riparian management. There is the possibility that developed recreation sites may disturb cultural resources. Riparian resources may also be harmed by developed recreation sites.

Ability to Resolve

This issue can be responded to through the designation of lands as developed recreation. The ability to resolve this issue is heavily dependent on the funding level of the recreation program.

Indicators of Responsiveness

The extent to which the alternatives are responsive to this issue can be evaluated by the following:

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

Wild, Scenic, and Recreational Rivers

Situation

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 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.

The Forest has decided to conducted Eligibility studies on 12 additional rivers. These rivers were specifically identified in the public comment process. 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. For explanation of the East Fork Hood River see FEIS Chapter I. Suitability studies for the other rivers will begin when the Forest Plan is completed.

Public concerns range from the desire for designation and full protection of all eligible rivers, to the belief that no additional Wild and Scenic rivers are needed and that existing protection is to restrictive. There is a concern that allocation of viewsheds outside the Wild and Scenic River corridor, in order to meet Visual Quality Objectives, may cause an unnecessary reduction in timber harvest.

Wild and Scenic River eligibility and designation has the potential to impact several other resources. Designation of rivers could enhance recreational opportunities, scenic quality, fish habitat, and water quality. On the other hand, Wild and Scenic River nomination and designation has the potential to limit development and reduce timber harvests.

Ability to Resolve

There are several ways to address this issue. Alternatives vary in the number and miles of rivers studied for Wild, Scenic, and Recreational River eligibility/suitability. Land allocations may also vary in resource emphasis on lands adjacent to Wild and Scenic Rivers. These will establish decisions regarding timber harvesting within corridors of the Recreation and Scenic sections of the designated and eligible rivers. Management direction can include the use of Visual Quality Objectives to maintain the character of the landscapes adjacent to the river corridors.

Part of the analysis will also include the suitability evaluation to provide the basis for recommendation for the East Fork Hood River.

Indicators of Responsiveness

The extent to which the alternatives are responsive to this issue can be evaluated by the following:

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

Deer and Elk Management

Situation

Concern was expressed that the Forest was not adequately providing for the management of deer and elk. Herd management objectives, cover forage ratios, forest wide road densities, and dispersion of harvest units were of concern. The removal of land from timber emphasis to meet the needs of deer and elk will result in a reduction in timber harvests.

The provision of deer and elk habitat can benefit from other resources. For example, the open spaces created by clear cuts can serve as foraging areas. Deer and elk habitat needs may conflict with the habitat needs of other species such as those dependent on mature or old growth forests.

Ability to Resolve

The main avenue for addressing this issue is through Standards and Guidelines. Standards which regulate the timing of timber harvests can enhance deer and elk habitat. The issue is also addressed through the allocation of land to winter and summer range allocations.

Indicators of Responsiveness

The extent to which the alternatives are responsive to this issue can be evaluated by the following:

- Potential Habitat Capability

Issues Addressed the Same Way for All Alternatives

Diminishing Supply, or Availability, of Resources Traditionally Used in Native American Religious and Cultural Life

Situation

The Community of Native Americans on the Warm Springs Indian Reservation have voiced concerns about a possible decrease in the supply or availability of forest products traditionally used in Native American's religious or cultural ceremonies. These resources include fish, wildlife and plants. Of particular importance are salmon and huckleberries. The issue involves the treaty rights of Native Americans to have access to and use Forest resources.

Because huckleberries grow best where the Forest is open and sunlight can reach them, concern about the huckleberries is most closely related to timber management and fire. Salmon are particularly important to the Native Americans, both for subsistence and ceremonial purposes. The concern regarding salmon is related to the fish habitat issue.

The Forest has cooperated with the leadership of the Confederated Warm Springs Tribes in order to ensure access to resource areas is not denied. The cooperation will continue. The American Indian Religious Freedom Act insures that Native Americans will have access to sites which will allow them to carry on their traditional religion.

This issue is related to several other issues. The level of timber harvest will indirectly affect the amount of huckleberries available in some areas. The management of fish and wildlife habitat, especially that for salmon, will

affect the amount of salmon and other species available to Native Americans.

Ability to Resolve

This issue will be addressed through Standards and Guidelines. Forest wide Human Rights Standards protect the rights of Native Americans to have access to and use Forest resources. Forest wide Cultural Resource Standards direct the Forest to, when appropriate, consult with Native American tribes. Standards for riparian areas reflect the recommendations of the Columbia River Inter-Tribal Fish Commission (CRITFC), in accordance with the Columbia Basin Anadromous Fish Policy. All alternatives will respond to this issue in the same way.

Although this issue is addressed in the same way for all alternatives, the issue will vary among the alternatives as a result of the way alternatives vary to address other issues and resources. Land use designation will, to some extent, affect the supply of ceremonial foods and fish. The amount of land designated for timber harvest will indirectly affect the amount of huckleberries available in some areas. The amount of land designated for fish and wildlife habitat management, especially that for salmon, will affect the amount of salmon and other species available to Native Americans.

Indicators of Responsiveness

The indicator listed for this issue is:

- 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.

Issues Addressed Outside the Planning Process

All Public Issues identified in FEIS Chapter I are addressed within the planning process.

Consultations with Others

Consultation with other agencies, local government, interest groups, and individuals has been constant throughout the planning process. The consultation described here covers the initiation of the Forest planning effort in 1979 to issuance of the DEIS and proposed Forest Plan in 1988, and subsequently, the consultations made between release of the DEIS and issuance of the FEIS. Appendix J (Response to Public Comment) provides a detailed description of the public participation activities carried out by the Forest during the public comment period following the release of the Draft Forest Plan.

Numerous meetings and individual contacts were made with various agencies and groups. The purpose of the contacts was to:

- Discuss the forest planning process.
- Identify additional issues that should be recognized.
- Identify any existing or ongoing plans of other agencies.
- Establish any necessary coordination plans.
- Consult on specific problems.

Contacts with individuals are not listed here, but are on file at the Supervisor's Office, Gresham, as part of the "planning records". The following list details contacts made with other agencies, Native American Tribes, and organizations.

Other Agencies

Federal Agencies

- Bureau of Indian Affairs (Ray Rangella)
- Bureau of Land Management (Dale Bays, Phil Hamilton, Mark Lawrence, Ken White)

- Bureau of Land Management Oregon State Office, Minerals Branch
- Department of Energy, Bonneville Power Administration
- Environmental Protection Agency
- USDA Office of General Council (Val Black)
- U.S. Army Corps of Engineers
- U.S. Fish and Wildlife Service (Russell Peterson, Diana Hwang)

State Agencies

- Oregon Department of Environmental Quality
- Oregon State Extension Department (David Small)
- Oregon State Parks and Recreation Department (Don Eixenberger, Alan J. Cook, John Lilly)
- Oregon State Department of Forestry (Gene Herb, Jim Tonkend, Gene Silvasky)
- Oregon State Department of Land Conservation and Development
- Oregon State Department of Mineral Industries
- Oregon State Department of Transportation
- State of Oregon, Office of the Governor (Norm Johnson, Reis Hoyt)

County and Local Agencies

- City of Portland, Water Bureau (Bruce Niss)
- Clackamas County Planning Dept.
- Clackamas County Planning and Economic Development (Thomas J. Vanderzanden)
- Columbia River Gorge Commission (Brian Litt)
- Hood River County Planning Department
- Multnomah County Planning Department
- Port of Cascade Locks (Robert Montgomery)
- Port of Hood River
- Wasco County Planning Department

Native American Tribes

- Confederated Tribes of the Warm Springs (Terry Luther)

Organizations

Colleges and Universities

- Oregon State University (Perry Brown, Rebecca Johnson, and Denver Hospodarsky)
- Oregon State University, Dept. of Forest Recreation Resources (Rebecca Johnson)

Interest Groups

- 1000 Friends of Oregon
- American Rivers (Tom Cassidy) Mt. Hood Study Group (Dave Corkran)
- Associated Oregon Loggers, Inc.
- Columbia River Inter-Tribal Fish Commission
- Farmers Irrigation District (Jerry Bryan)
- Friends of the Columbia Gorge
- Industrial Forestry Association
- Mt. Hood Alliance
- Mt. Hood Recreation Association (Keith Petrie, Dave Butt)
- National Wildlife Federation (Rick Brown)
- Northwest Forest Resource Council
- Northwest Forestry Association
- Northwest Timber Association
- Oregon Environmental Council
- Oregon Rivers Council (Bob Doppelt)
- Portland Area Ski Club Council (Linda McGavin)
- Portland Audobon Society (Marc Liverman)
- Sierra Club (Dave Corkran)
- Sierra Club, Oregon Chapter (John Sherman and Barbara Slaughter)
- Western Forest Industries Association

Businesses

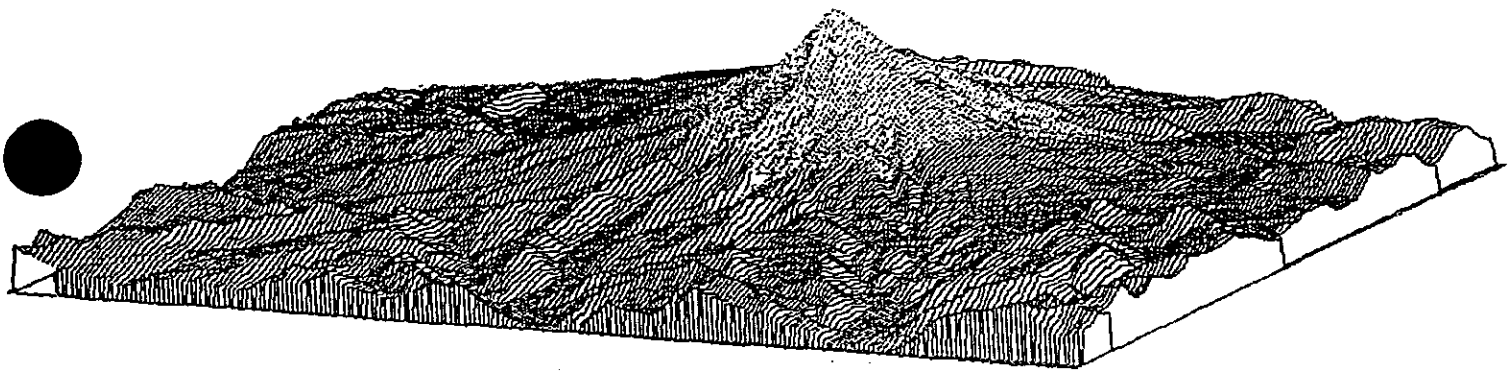
- Avison Lumber Company (Mickey Bellman)
- Hanel Lumber Company (Sterling Hanel)
- Mt. Hood Meadows Ski Resort (Glenda Phillips)
- Mt. Hood Welcome Publishing (Marilyn Peterson)
- Multnomah Falls Inc. (Rick Buck)
- Oregon Park and Recreation Society Inc. (Ann Snyder)
- Timberline Lodge (John O'Neill)

Individuals

- See planning records located at the Supervisor's Office, Gresham.

Appendix B

Description of the Analysis Process



Appendix B
Description of the Analysis Process

Appendix B - Description of the Analysis Process

Introduction

Planning Situation

The Forest Service is responsible for determining how best to manage National Forest lands based on public desires and land capabilities. The public and management have a number of complex interests and divergent viewpoints on how the Forest resources should be managed, and how such management would affect surrounding communities. The major goal of this Forest planning process is to provide enough information to help decision makers determine which alternative combination of Forest goods, services, and land uses will most cost effectively produce the greatest long-term public benefit in an environmentally sound manner while responding to issues and concerns. This appendix describes the analysis process that led to the identification of a Preferred Alternative.

Major Changes Between Draft and Final

Largely in response to industry comments, a number of FORPLAN modeling specifications have been changed. Overall, the changes caused by the new vegetative inventory, a new assessment of tentatively suitable acreage, and the modeling of additional management opportunities have resulted in a difference in LTSYC projections of less than 1 percent, based on a comparison of the estimates of biologic potential for the Forest. Changes in the modeling of management requirements, which are included in benchmark 7, show a decrease in LTSYC projections of 14 percent relative to the draft. Details of these changes are discussed below and in other sections of this appendix.

New Vegetative Inventory

A number of comments to the Draft related to outdated or insufficient information, especially in regard to the Forest vegetative condition. To respond to these concerns the Forest incorporated the results of a recent vegetative inventory into analysis performed between the draft and final. The two major products of this inventory were a new map of vegetative condition and measurements of timber standing volume and growth. As a result of this new inventory, changes were made to the tentatively suitable timber acreage, all aspects of the timber yield tables, and other acreage estimates based on vegetative condition.

Yield Table Updates

The timber yield tables for existing and regenerated stands were updated to account for the new inventory information and for growth that will have taken place by 1995. Also, the new inventory information and recent timber sale data was used to update both the calculations of gross to net volume and the conversion of cubic feet to board feet.

Condition Class Updates

The number of acres by age class was changed as a result of the new vegetative inventory and to reflect recent harvest activity since that inventory. The age class distribution modeled in FORPLAN includes timber sales through the end of fiscal year 1989.

Thinning and Fertilizer Opportunities

Thinning and fertilization opportunities were increased significantly in the FORPLAN model. Fertilization opportunities in the Western Hemlock and Silver Fir Working Groups increased by over 68,000 acres.

Increased Tentatively Suitable Acreage

Tentatively suitable lands for timber production have increased in the FEIS by 31,300 acres. A change in the definition of "forestland" in the revised NFMA regulations, land exchanges, and a re-examination of lands on which irreversible resource damage would occur resulted an increase in the tentatively suitable acreage. Some of the increase was offset by the new Wild and Scenic River designations and a re-evaluation of acres with regeneration difficulties.

Wildlife Management Requirements

Changes occurred between the draft and final concerning cavity excavators, spotted owl, pileated woodpecker and pine marten habitat.

Adjustments were made to all timber yield tables to account for the number of snags retained per acre. To fulfill an objective of 40 percent of biological potential forestwide, future harvest units retained snag levels at 60 percent of biological potential.

The Forest adopted the direction from the ROD for the spotted owl FSEIS, and modeled it with 1500 acre management areas which preclude harvest activity rather than a long rotation strategy to maintain the required suitable habitat. The Forest adopted the same no harvest management strategy for pileated woodpecker and pine marten habitat areas. See Appendix F for a discussion of this decision.

Other MR Constraints

The dispersion constraint was changed from 32 percent of each management area to 25 percent of each major drainage. This constraint attempts to prevent the FORPLAN model from scheduling harvest adjacent to areas which are currently openings. While the change to this constraint made it more restrictive, generally this constraint was not binding.

Changes were made to the way that General Riparian was modeled. The intent remained the same and similar results were achieved from the modeling.

A new management requirement was formulated that limited the watershed impacts on each major drainage. It was designed to require a minimum amount of area in each drainage to be in a recovered condition in each decade of the planning horizon.

Socioeconomic

Primary zone of influence used in the IMPLAN model was increased from four to six counties. The draft included Multnomah, Hood River, Clackamas, and Wasco Counties. Washington and Yamhill Counties were added for the final.

Economic Efficiency

Costs used in the FORPLAN model were re-evaluated between draft and final. Costs that were no longer valid were revised to reflect actual expenses in fiscal years 1988, 1989, and 1990. These values were then adjusted to 1982 dollars.

DEIS Alternatives Eliminated from Further Consideration

Three alternatives developed in detail in the DEIS were eliminated in the FEIS. These included alternative B, which attempted to meet the RPA Program; alternative D, which relaxed the nondeclining flow constraint while attempting to provide present levels of harvest; and alternative G, which contained the same allocations as alternative E but provided a non-declining flow of timber. All three were dropped due to little or no support during the public review process, their similarity to other alternatives, and objectives that could be better met by other alternatives.

Planning Process

The planning process specified in the National Forest Management Act (NFMA) and the regulations developed under NFMA (36 CFR 219) provide the analytical framework used to develop the Final Environmental Impact Statement (FEIS) and these Appendices. These directions also state that the requirements of the National Environmental Policy Act (NEPA) and the Council of Environmental Qualities Regulations for NEPA (CEQ, 40 CFR 1500-1508) must be applied in this analysis process.

The planning and environmental analysis process brings a new outlook and a new technology to National Forest land management, principally: (1) processes formerly used to make individual resource decisions are now combined to help make integrated resource management decisions, and (2) new mathematical modeling techniques are used to assist in the proposed land use problem, including identifying the most cost-effective pattern of land management. Eight steps in this planning process are described in Chapter I of the FEIS. The eight steps are:

1. Identification of Issues, Concerns and Opportunities
2. Preparation of Planning Criteria
3. Inventory Data and Collect Planning Information
4. Analysis of the Management Situation
5. Formulation of Alternatives
6. Estimation of the Effects of Alternatives
7. Evaluation of Alternatives
8. Recommendation of a Preferred Alternative

This appendix describes the analysis processes covered by Steps 3, 4, 5, and 6. The judgmental portion of the process is covered by Steps 1, 2, 7, and 8, and is described in Chapters I, II, and in Appendix A of the FEIS.

The needs and expectations of people associated with this Forest, placed in the context of the Forest's biological potentials and limits, are summarized into a group of Issues, Concerns, and Opportunities (ICOs). These ICOs, presented in Chapter I, are key to all steps in the analysis process. Each ICO can be addressed from several points of view. These differing points of view, or solutions, were used to develop alternatives which explore different approaches to managing the entire Forest. Subsequently, they were used to compare and evaluate these alternatives and select a preferred alternative. Thus, the initial step of ICO identification is critical to the development of alternatives and is directly related to the final decision to be made.

Of the eight planning steps, the analytical elements discussed in Appendix B are as follows:

Inventory Data and Collect Information

The Interdisciplinary Team determined what data were necessary based on the issues and concerns. The Analysis of the Management Situation, formulation of alternatives, and monitoring, require data on resource capabilities, existing supply and demand, expected outputs, benefits, and costs. Existing data were used whenever possible but were supplemented with new data to help resolve sensitive ICOs. Data are on file in the Forest Supervisor's Office.

Analysis of the Management Situation

This analysis examines resource supply and market conditions and determines suitability and feasibility for resolving issues. A land use allocation and scheduling model (FORPLAN) was used to address a number of specific requirements, including benchmarks. Requirements include: (a) the projection of the Forest's current management program; (b) determining the Forest's ability to produce a range of goods and services from the minimum management to maximum production; (c) evaluating the feasibility of reaching the national production goals (RPA targets) and social demands identified as issues and concerns; and (d) identifying monetary benchmarks which estimate the output mix which maximizes present net value of resources having an established market or assigned values. The Analysis of the Management Situation (AMS) document is on file in the Forest Supervisor's Office.

Formulation of Alternatives

The information gathered during the first four planning steps is combined and analyzed to formulate alternative management plans. The alternatives reflect a range of resource management direction. Each major ICO was addressed in one or more alternatives. Management prescriptions and practices were formulated to represent the most cost-efficient way of attaining the objectives for each alternative. Both priced and non-priced outputs were considered in formulating the alternatives.

Estimation of Effects of Alternatives

The physical, biological, economic, and social effects of each alternative were estimated and analyzed to determine how each responds to the ICOs. FORPLAN was used to estimate many of the economic and physical effects, while other methods were used for remaining effects. The analysis included: (a) direct effects; (b) indirect effects; (c) conflict with other Federal, State, local, and Indian tribe land use plans; (d) other environmental effects; (e) energy requirements; (f) natural or depletable resource requirements and conservation potential; (g) means of mitigation.

Inventory Data and Information Collection

Forest Database

The Forest planning process required the collection of data for numerous resources. Issues, Concerns, and Opportunities (ICOs) needed to be addressed, along with determining resource potential and limitations. Data collected included not only basic information about the land, vegetation, and wildlife, but also dealt with resource values, supply and demand relationships, costs of management, effects of management, and the social and economic interactions between the Forest and the surrounding communities.

This section discusses the collection and use of data necessary to develop basic land and vegetation resource information, especially for the development of the FORPLAN model. Other data needs, collections, and uses are also reviewed.

Capability Areas

A capability area is a unit of land for which an identified output or effect can be estimated. The capability of the land to provide various outputs and use opportunities, along with other positive and negative effects of management, required two types of resource information; the existing condition of each resource and how that condition responded to natural processes or management activities. Vegetation needed to be identified by species, size, and condition to determine, for example, wildlife habitat capability, and the volume and value of existing timber. Specific resource information, such as roadless area boundaries, big game winter range, and viewsheds, was assembled. Administrative boundaries were also identified, including ranger districts and wilderness areas. Much of the necessary data was primarily collected or developed from existing resource inventories, such as the Forest's TRI (Total Resource Inventory) data base. At times, several resources were combined to define other data attributes. When necessary, these created attributes were reviewed by field personnel for validity.

Most of the collected resource information was assembled on maps, which were entered into a Geographic Information System (GIS) called MOSS. These maps were then overlaid in the GIS and the results of that process were placed in a computer database. This database contains over 94,000 records, each record representing a unique combination of attributes and range in size from 2 to 1831 acres. The database was used to stratify and aggregate capability areas to form analysis areas.

Analysis Areas

One of the first steps in the development of FORPLAN was to divide the Forest into analysis areas using the attributes defined in the Forest database. Analysis areas are tracts of land assumed to be homogeneous in terms of the outputs and effects being analyzed within the FORPLAN model. They serve as the basic unit of land in the model to which a range of prescriptions could be applied to achieve various multiple use objectives. The delineations were intended to capture the significant biological and economic differences in the way the land responds to alternative management strategies, and to keep the model size to a minimum for cost and time efficiency reasons. Also, only the land which was determined to be tentatively suitable for timber production was included in the FORPLAN model. Adjustments were made to modeling constraints and outputs to account for this modeling approach. The analysis areas were stratified, using the FORPLAN level identifiers, which are described later, in order to address issues, concerns, and opportunities identified at the outset of the planning process.

The Forest planning team changed the analysis area identifiers for the FORPLAN model between the DEIS and FEIS. Several different analysis area stratifications and model formulations were explored. These different models assessed different ways of estimating, constraining, and reporting the activities, outputs and effects of management practices to determine the best method of addressing the ICOs. The new analysis area identifiers reflected changes caused by the new vegetative inventory and attempts to better respond to comments received.

The final stratification of the model, which was constructed in May of 1990, reduced model size by representing in FORPLAN only the lands that could receive vegetative management activities (those determined suitable through the timber suitability process). The changes to lands that would never receive vegetative management activities were tracked outside the FORPLAN model. At this point, combining of the numerous resource data sources still generated over 1000 unique areas. To generated a reasonable set, small areas (less than 250 acres) were collapsed into analysis areas that had similar attributes. This divided the Forest's 678,450 tentatively suitable acres into a final set of 359 analysis areas. In addition to the basic vegetative information contained in analysis areas, the Forest was

also divided into major drainages to assess area-wide effects of management, to improve the juxtaposition of land allocations, and to improve reporting capabilities.

The rationale and the data requirements for the FORPLAN analysis areas are discussed next. FORPLAN normally uses up to six levels of identifiers to define the land component of the model (analysis areas) and two additional identifiers, Level 7 and Level 8 to define prescriptions which include management emphasis and management intensity. Levels 7 and 8 are discussed in Appendix B - Identification of Prescriptions. All of the levels are user-controlled which allows for a descriptive identification of the analysis areas and prescriptions. The level identifiers represent the key characteristics of the analysis areas and are used to provide spatial definition or to identify differences in management costs and effects. The level identifiers also are used for constraining and reporting activities, outputs, and environmental effects.

Level 1 - Major Drainages

- Columbia River
- Bull Run River
- Sandy River
- Salmon River
- Lower Clackamas River
- West Fork of Hood River
- East Fork of Hood River
- Miles Creeks
- Badger-Jordan
- Fish Creek, Memaloose River & Molalla River
- Oakgrove Fork of Clackamas River
- Upper Clackamas River, Warm Springs, Breitenbush & Olallie
- Collawash River
- Hot Springs Fork of Collawash River
- White River

The level 1 analysis area identifier is used to indicate the general location of each analysis area. The fifteen major drainages identified divide the forest into areas which address issues related to cumulative effects and impacts that are area-specific rather than acreage-specific. Examples include dispersion of harvest units, watershed impacts, and big game forage/cover relationships. By placing major drainages in FORPLAN, constraints were developed and applied at the drainage level to groups of analysis areas. Also, outputs and effects were analyzed at the drainage level allowing more meaningful interpretation than achievable with forestwide or analysis area level results.

Level 2 - Not Used

Level 3 - Timber Working Group and Timber Site

- Western Hemlock - Site 72
- Western Hemlock - Site 87
- Pacific Silver Fir - Site 74
- Pacific Silver Fir - Site 78
- Mountain Hemlock - Site 55
- Grand Fir - Site 64
- Grand Fir - Site 82
- Grand Fir - Site 95
- Separate Suitability Component

Level 3 is used to identify the timber working group and to classify the natural productivity of tentatively suitable timberlands. Four timber species aggregations (working groups) were combined with timber site information to generate eight categories. The separate suitability component was identified through the timber suitability process and is tracked as a separate category. Each Working Group is composed of several different species which are described under "Development of Timber Options and Timber Yields", elsewhere in this appendix.

The timber working group delineation was key in addressing many of the planning issues. Each group has a different habitat potential for different wildlife species. Each Working Group also has unique conditions that reveal differences in growth potential, timber value, costs of management, and silvicultural practices.

The additional site information is necessary to analyze issues relating to the intensity of timber management on different types of lands. The costs of intensive timber management practices can be compared to the economic value of the increased timber yields. Prescriptions that include fertilization and other intensive silvicultural practices are only applied to lands where experience has shown benefits.

Level 4 - Timber Size Class

- Multi-storied
- Large Saw
- Small Saw
- Natural Poles
- Managed Poles
- Saplings
- Seedlings

- No Size Class

Level 5 - Stocking Level

- High Stocking
- Medium Stocking
- Low Stocking
- High and Medium Stocking
- Medium and Low Stocking
- All Stocking Levels
- Nonstocked

The level 4 and 5 identifiers stratify the forested lands into existing condition classes. These classes represent ecological seral stages denoting a range of ages, sizes, and stocking levels. The condition classes are used to identify the appropriate silvicultural treatments which are allowed during the next entry.

These identifiers, when used with level 3 working groups, define specific habitat types and how the habitat naturally changes for various wildlife species. Since the condition classes represent size of timber, economic values based on diameters can also be determined for each working group and condition class combination.

Linkages to the Forest Plan Database

The development of a Forest Plan database, as discussed earlier in the Capability Area section, provided additional analysis capabilities. Each of the over 94,000 records in the database was also assigned the same identifiers that were used to define FORPLAN analysis areas. Therefore, each analysis area is directly linked to a number of database records that have additional resource information about that analysis area. For example, a query of the database would be able to report how many acres in each analysis area are in the foreground of a particular viewshed. Using this information in the FORPLAN model, those acres can either be assigned to a particular management strategy or included in an acreage constraint.

Production Coefficients

The ID Team developed output coefficients (yields) for timber, wildlife, fisheries, recreation, and sediment. Timber and sediment coefficients were include in the FORPLAN model while other resources used outputs from FORPLAN to measure the impact of various management activities. The FORPLAN outputs used in this way include the acres treated, volume harvested, and changes in vegetative condition over time.

Some resources based their effects on changes in the vegetative condition over the planning horizon. Examples of this include the acres of wildlife habitat and forage/cover relationships. Other resources measure the direct effect of activities, such as timber harvesting. The amount of sediment created is linked to the acres of regeneration harvest. Some resource outputs cannot be based solely on the number of acres treated or the number of acres in a particular condition. These outputs require additional information which is not modeled in FORPLAN. An example is transportation analysis which must consider which areas are to be entered, the condition of the current road system in that area, how much traffic the system will carry, and how the road system will be financed. Compounding factors include roadless areas, recreation versus logging traffic, and road closures. This analysis incorporates outputs from FORPLAN with information from other sources.

Activity costs were estimated based on recent experiences. Most costs were dependent upon the level of production of a given resource, while others were assumed to be fixed for a given alternative throughout the planning horizon. Forest Service budgetary costs associated with timber management activities were accounted for within the FORPLAN model. A more detailed discussion of the resource coefficients is found in Appendix B - Development of Yield Coefficients. Appendix B - Economic Efficiency Analysis will explain the development of costs and benefits used in the model.

Lands Suitable for Timber Production

The National Forest Management Act requires the identification of lands not suitable for timber production. A three stage process is used. The first stage is tentatively suitable, the last two stages address conditions of economic suitability and interactions with other resource objectives.

Stage 1 unsuitable lands are:

- Not part of the National Forest System (other ownership).
- Not Forest land as defined in NFMA.
- Withdrawn from timber production by an Act of Congress, the Secretary of Agriculture, or the Chief of the Forest Service.
- Lands on which technology does not exist to ensure timber production without irreversible resource damage to soil productivity or watershed conditions.

- Lands on which there is not reasonable assurance that adequate restocking can occur as provided in NFMA.

The Mount Hood National Forest has identified lands in all five categories listed above. An interdisciplinary team, consisting of people with responsibilities in silviculture, soils, and ecology, used a four screen process to perform the analysis (Daoust, D., et al 1988).

Not part of the National Forest System.

All lands within the National Forest boundary total 1,102,800 acres. Of this total, 39,350 acres are in other ownerships. No attempt was made to determine their productive capabilities.

Screen 1: Non-Forest.

Identified by the Forest and subject to extensive District review were 18,200 acres of water, 76,350 acres of lands not stocked with at least 10% coverage of tree canopy, and 20,000 acres of lands developed for purposes other than timber production (roads, utility corridors, work sites, etc.). The Screen 1 total is 114,550 acres.

Screen 2: Withdrawn from timber production.

Categories of lands withdrawn include Wilderness (160,800 acres), Research Natural Areas (1,700 acres), Wild and Scenic rivers (6,300 acres), and Special Interest Areas (50 acres). The Screen 2 total is 168,850 acres.

Screen 3: Irreversible resource damage.

Recognizing that irreversible resource damage (mass wasting) can occur with specific geological factors in combination with timber harvesting, 20,900 acres were identified by the Forest and subject to extensive District review as those on which timber harvesting would cause acceleration, enlargement, or initiation of mass wasting. The Screen 3 total is 20,900 acres.

Screen 4: Regeneration difficulty.

Mapped soil types that had questionable regeneration capabilities were evaluated by the Forest and subject to extensive District review. There is no reasonable assurance of adequate restocking within five years of final harvest on 80,700 acres. The Screen 4 total is 80,700 acres.

The technical (biological) unsuitable acreage total is 101,600 acres. The total unsuitable acreage is 385,000 acres.

Using all criteria to this point completes Stage I of the land suitability process. Stages II and III occur later in the Forest planning process. Table B-1 summarizes the number of acres that were categorized into each Stage I suitability screen.

Informal discussions were held to coordinate approaches and assumptions with the Gifford Pinchot, Willamette, and Siuslaw National Forests. Primary coordination was through a structured Regional Office review process conducted in November, 1983. Each Forest submitted their suitability stratification analysis results to the Region at that time. Several updates have occurred since then, with the final update in February 1990.

Allocation and Scheduling Alternatives

The data requirements for identifying analysis areas along with additional requirements to address issues, concerns, and opportunities were used to develop the land allocations and activity schedules for each alternative. The minimum and maximum potentials of the Forest to provide scenic quality, unroaded recreation opportunities, timber harvest, and wildlife and fish habitat improvements were tied to the analysis area identifiers. Each alternative addresses part of the range of potential solutions to the ICOs by allocating portions of the Forest to particular management activities. The schedule of activities is also tied to and influenced by the analysis area identifiers. The existing condition and potential of the land, given other resource needs, were key to determining the timing, intensity, and amount of timber harvest and wildlife habitat improvement activities. The resulting activity schedules and land allocations, in combination with the Forest resource data base, will provide the basis for Plan implementation and monitoring.

Plan Implementation Programs

The data base provides biological and physical data that will help develop subsequent programs for Plan implementation. As more resource data becomes available, the data base will be updated and improved. Information will be keyed to subparts of the Forest known as "Management Areas" which will become the backbone for monitoring and implementation as well as data management. Refer to the Forest Plan document for more details on implementation and monitoring.

Monitoring

At intervals established in the Forest Plan, management practices will be evaluated to determine how well objectives have been met, the accuracy of cost estimates, and how closely management standards and guidelines have been applied. The results of monitoring and evaluation may be used to analyze the management situation during review of the Forest Plan in future years.

Table B-1 Land Tentatively Suitable for Timber Production

	Not Suited for Timber Production		Totals
Total National Forest Area			1,102,800
Other Ownership		39,350	
Net National Forest			1,063,450
Screen 1: Non-Forest		114,550	
Water	18,200		
Not Stocked with 10% Tree Cover	76,350		
Lands developed for other than Timber Production Purposes	20,000		
Forested Lands			948,900
Screen 2: Withdrawn from Timber Production		168,850	
Wilderness Areas	160,800		
Research Natural Areas	1,700		
Wild Rivers	6,300		
Special Interest Areas	50		
Screen 3: Irreversible Resource Damage		20,900	
Screen 4: Regeneration Difficulty		80,700	
Seperate Suitability Component			6,350
Lands Not Suitable for Timber Production		385,000	
Lands Tentatively Suitable for Timber Production			678,450

The Forest data base will provide a means by which changes in resource production rates, differences in inventory data, etc., can be measured and will also be used to monitor implementation activities.

Sources of Data

Soils

The Soil Resource Inventory for the Forest was completed by soil scientists over a period of several years, with the report and maps being released in 1979. The original work has been revised as new information became available. Soil delineations (mapping units) are mapped at a scale of 1:63360 and the inventoried data forms the basis for the Forest's suitability determinations. The sediment delivery index model, used in FORPLAN, was developed from this inventory, review of scientific literature, and the application of professional judgment and experience by the Forest's soil scientists.

Hydrology

Streams, wetlands, floodplains, and other riparian features were mapped from aerial photographs and ground inventory prior to 1984. Map and photo analysis, combined with field surveys, was used to estimate the extent of streams, lakes, seeps, springs, wetlands, and other riparian components. Streams were determined to be either perennial or intermittent, and were further classified as Class I, II, III, or IV, on the basis of their use, using direction provided by FSM 2520. This information forms the basis for estimating the extent and type of riparian lands on the Forest.

Key Site Riparian areas were identified by field inventory and delineated on aerial photographs (scale 1:15840). The inventory information was transferred to maps (scale 1:63360) and entered into the GIS in 1989.

The inventory of potential and recommended Special Emphasis Watersheds was prepared from data and recommendations provided by District and Forest resource specialists. The determination of suitability for allocation as Special Emphasis Watershed considered factors such as inherent sensitivity and resource uses and values. This inventory was transferred to maps at a scale of 1:63360 and entered into the GIS in 1989.

Timber

Several updates to the Stage I, Timber Suitability Analysis have occurred since it was originally completed. The latest update occurred in February 1990. One major update resulted from changes made in the NFMA regulations. The process and revisions are contained in part of the planning records at the Supervisor's Office. Maps used in the analysis of timberland suitability have been entered into the GIS and are also available in the Supervisor's Office.

Existing timber volumes and growth were based on a timber inventory "Vegetative Resource Survey" (Teply, 1986), conducted in 1986. Four hundred and forty-five (445) stratified random ten-point permanent cluster plots provided data on volume, growth, mortality, productivity, damaging agents, and wildlife trees. Plots were distributed according to a model based on similar tree species, size classes, working groups, and stocking levels. The inventory process and formulation of yields is described in a document entitled "Yield Tables" (Daoust, D., et al 1990). Results of the inventory are summarized in "VRS Statistics for the Mt. Hood NF 1986". Acres of each model component were determined by photo-interpretation and field checked in 1985. These component acres also reside in the GIS.

Economics

Benefit values for recreation and wildlife were taken from the 1985 RPA Assessment. Benefit values for timber were derived from Forest Cut and Sold Reports. All costs were estimated using the most current Forest data.

Recreation

The Recreation Opportunity Spectrum classification was completed in 1984 by recreation planners using the 1982 Forest Base. This inventory was transferred to registered overlays and entered into the GIS using the 1988 Forest Base.

Recreation Information Management (RIM) data is compiled annually by each Ranger District and consolidated information is provided on recreational use estimates, facilities, and conditions. Recreation Visitor Day (RVD) coefficients were based on 1983 RIM statistics. Recreation supply (capacity) for dispersed and developed recreation was based on the ROS coefficients of RVDs/acre/year.

The calculation of demand for dispersed recreation used SCORP (Statewide Comprehensive Outdoor Recreation Plan) growth figures based on the Pacific Northwest Demand Survey. Demand for developed recreation used the assumption that demand is a function of population growth.

Existing Roadless Areas acreage and boundaries were updated using new information from the recent vegetative inventory.

Existing and potential Special Interest Areas were transferred from the 1982 Forest base to registered overlays and entered into the GIS. The Forest trail system was inventoried for sensitivity levels and mapped on registered overlays. After being entered into the GIS, a 1/4 mile buffer was applied to each trail.

Cultural

Cultural resource analysis for the Plan has been generated from a review and assessment of existing information found in the Forest's cultural resource files and in pertinent laws, regulations and policies. This information includes data compiled over recent years from cultural resource surveys and management activities, such as the number of acres inventoried on the forest, the number of historic and archaeological sites recorded and the number of sites evaluated for eligibility to the National Register of Historic Places.

Scenic Quality

The viewshed corridor mapping, originally done for the DEIS in 1987, was revised in 1989. The Perspective Plot computer program was used to calculate the area visible from selected travel routes, based on topographic data.

The Visual Quality Objectives (VQO) maps (scale 1:63360) were updated in 1984 to reflect revisions in the sensitivity level inventory, which was completed in 1983.

The Existing Visual Condition (EVC) of the Forest was inventoried in 1980, utilizing (Scale 1:63360) aerial photography dated 1979. This inventory is no longer

valid as a basis for comparison of existing and future conditions. It will be maintained as a historical reference point. The Resource Summary in Chapter IV of the Plan calls for an update of existing visual condition in 1991.

The visual resource inventory maps are stored in the Recreation & Lands section, and are also filed electronically in the GIS at the Mt. Hood National Forest Supervisor's Office in Gresham, Oregon.

Wild and Scenic Rivers

Two rivers, the Salmon and Clackamas, were identified as potential Wild and Scenic Rivers in the National Rivers Inventory, published by the USDI - National Park Service in 1982. These rivers, as well as the White, Roaring, and Sandy rivers were all designated as Wild and Scenic Rivers in the Omnibus Oregon Wild and Scenic Rivers Act of 1988.

Other potential Wild and Scenic River candidates were identified by the State of Oregon, conservation organizations, and members of the general public.

This information is stored in the Recreation Department at the Mt. Hood National Forest, Supervisor's Office in Gresham, Oregon.

Protection

The National Fire Management Analysis System was used to analyze the economic efficiency of different fire protection organizations. This system displays the expected number of acres burned by wildfire, the predicted expenditure of fire fighting funds for suppression, and the expected damage when different fire protection forces are dispatched. These estimates are based on information about wildfires which have historically occurred on the Forest.

Taking into consideration the level of dead woody residue to be left on the ground, fuel managers determined the percent of time that different fuel treatment methods would be used and the cost of performing those treatments. This information combined with FORPLAN estimates of acres treated by regeneration harvests, commercial thinning, and precommercial thinning allowed fuel treatment estimates to be made for each alternative. These estimates indicate the acres requiring treatment by prescribed fire or other methods and the estimated annual cost.

Estimates of particulate matter less than 10 microns in size (PM10) was necessary to determine if a particular alternative meets State air quality goals. Fuel consumption and PM10 emission factors were provided by the PNW Forest and Range Experiment Station in Seattle. These factors were applied to prescribed burning levels occurring from 1976-1979 to determine the tonnage of PM10 produced during this "baseline" period. These same factors were applied to the prescribed burning levels estimated for each alternative and the results were compared to the baseline period.

Land Status

Land status information is taken from the Forest Landownership Status System. The information was updated in 1990 by the Forest Realty Specialist to incorporate current ownership status.

Wildlife

The Forest's vegetation database (VEG88) was used as a basis for identifying suitable habitat for wildlife habitat capability coefficients. Habitat areas for the indicator species were entered into the GIS. The Oregon Heritage Database was utilized in determining those species of Threatened, Endangered and Sensitive species found in the Forest. TSPIRS was used for economic analysis.

Deer and elk winter range was mapped by District resource staffs and Department of Wildlife personnel in 1990, at a scale of 1:15840, and was entered into the GIS. Criteria used were those developed for the Forest Plan.

MR pine marten and pileated woodpecker habitat areas, meeting Regional Guide criteria, were mapped at a scale of 1:63360 by Supervisor's Office biologists. Data from the vegetative inventory was used to identify suitable habitat.

The Forest's 1500 acre Spotted Owl Habitat Areas in the current Spotted Owl Management Plan and pair protection areas where additional pairs of spotted owls had been found, were mapped by District resource staffs and reviewed by the Supervisor's Office. They were transferred to a map (scale 1:63360) by biologists in the Supervisor's Office. The 66 spotted owl habitats were selected from this inventory to meet the criteria included in the Final Supplemental EIS to the R-6 Regional Guide.

Bald Eagle Habitat Areas were designated in the nine recovery locations identified by the US Fish and Wildlife Service in the Pacific Bald Eagle Recovery Plan. They were mapped by District resource staffs and reviewed by the Supervisor's Office. They were transferred to a map (scale 1:63360) by Supervisor's Office biologists and then entered into the GIS.

Merriam's turkey and silver-gray squirrel habitat (pine/oak) was identified and mapped (scale 1:15840) by District resource staffs and Oregon Department of Fish and Wildlife personnel in 1989. The areas were subsequently entered into the GIS.

The Forest Planning Model

Introduction

The purpose of this section is to explain, in greater detail, the role of the FORPLAN model during the analysis and the process used to construct the resource inputs to the model's formulation. This section will discuss the analysis done prior to the FORPLAN model, the analysis done with the aid of FORPLAN, and the analysis done in addition to, or "outside" of, the FORPLAN model. The process used to develop management prescriptions for use in the FORPLAN model will be presented. Following the prescription development, the process used to construct resource coefficients or yields for use in FORPLAN is explained.

Overview

Forest Planning is a very complex process in which an enormous amount of information and interdependent decisions must be considered before an alternative management plan can be recommended. Several interrelated computer models and analytical tools have been developed and utilized to help determine the decision space within which alternatives can be developed and to evaluate their associated outputs and effects. The models were used in planning step 4 through to the Analysis of the Management Situation, the Formulation of Alternatives and the Evaluation of Alternatives.

The main analytical model used in the above planning steps was FORPLAN. The name is an acronym for **FOR**est **PLAN**ning Model. FORPLAN is a computerized linear programming model which has its roots in RAM (Resource Allocation Model) and MUSYC (Multiple-Use Sustained-Yield Calculations). The model is composed of a matrix generator, a linear programming (LP) solution system, and a report writer. Within the bounds of the matrix generator and the LP solution package, the user is allowed a great deal of latitude in formulating the mathematical representation of the Forest planning problem to be analyzed. Two versions of the FORPLAN model have been constructed since 1982; Version I and Version II. The Version I model was an enhanced marriage of the RAM and MUSYC models and required intensive data input by the users. Version II was constructed in response to Forest's requests for a more flexible model with more ability to handle a greater number of resource inputs and outputs for defining a Forest's joint production structure. In 1989, a microcomputer-based version of FORPLAN with all the mainframe Version II capabilities became available.

The model used for the analysis in the DEIS was built using FORPLAN, Version I and run on the UNISYS computer at Fort Collins, Colorado. In May 1990, the interdisciplinary team decided to convert to the microcomputer version of FORPLAN due to added capabilities, increased modeling efficiencies, and reduced costs.

The Mt. Hood FORPLAN model was specifically designed to help the interdisciplinary planning team analyze the economic and production tradeoffs associated with recreation, timber, visual, and wildlife resources. The model was also designed to help evaluate the extent to which various alternative management opportunities were able to address and resolve the identified planning ICOs. One key step in the development of the FORPLAN model was to divide the total Forest into analysis areas discussed in the previous section.

In the FORPLAN model, analysis areas were allocated to management emphases in order to achieve the resource management objectives of a particular benchmark or alternative. "Management Emphasis" is a FORPLAN term and is directly related to the management strategies described in Chapter 4 of the Forest Plan. Each management strategy contains a set of standards and guidelines which defines how the resources are to be managed in order to meet the multiple use objectives of the management strategy. From 1 to 9 different management emphases were available to each analysis area depending upon resource production opportunities.

"Management Prescriptions" were developed to achieve the multiple use objectives of each management strategy. In FORPLAN, prescriptions are combinations of management emphases and intensities on specific analysis areas. Intensities are represented by different sets of vegetative management and investment options. The prescriptions are used to schedule activities and practices, and define the associated outputs and effects. The outputs and effects associated with the prescription choices are represented as mathematical coefficients within the FORPLAN matrix. FORPLAN had from 1 to 23 intensities to choose from for each management emphasis, for

each analysis area, depending on the existing and potential vegetative condition of the area.

The prescriptions FORPLAN selected depended upon the objective function and the set of constraints used to represent a particular benchmark or alternative. The objective function is a mathematical equation which shows how the Forest's objective (maximize present net value or maximize timber production, for example) is affected by the values explicitly portrayed in management prescriptions. Constraints are mathematical equations which require that a given amount of an input or output variable be achieved. The given amount is also termed the right-hand side (RHS) due to its location within typical matrix representations. All constraints must be satisfied before an optimal solution to the objective function is reached. The constraints were designed to guarantee the spatial and temporal feasibility of land allocation and scheduling choices in order to achieve the multiple use objectives of a benchmark or alternative. Once the model had arrived at a feasible solution through satisfying all of the constraints, the algorithm would search for the set of prescriptions and timing choices which maximized the value of the objective function.

Analysis Process and Analytical Tools

As discussed in the Planning Regulations (36 CFR 219.12): *"Each alternative shall represent to the extent practicable the most cost-efficient combination of management prescriptions examined that can meet the objectives established in the alternative."*

The interdisciplinary team analyzed economic efficiency at several stages of the planning process in order to be reasonably assured that the alternatives developed and displayed complied with the intent of the direction. The discussion of the analytical process and tools used will follow the general outline below:

- Analysis prior to FORPLAN
- How FORPLAN was used
- Analysis done in addition to FORPLAN

Analysis Prior to FORPLAN

Once the issues, concerns, and opportunities were identified, and planning criteria developed, the interdisciplinary team began to formulate management strategies and their associated standards and guidelines. This step was probably one of the most difficult, and possibly the most important task of the interdisciplinary planning process. Management strategies, coupled with their respective standards and guidelines, provide direction for implementation, and serve as a framework for how to use, develop, and protect the Forest's resources in a manner consistent with the goals and objectives.

Since the standards and guidelines provide general, rather than site or project-specific direction on how to implement the Forest Plan, there was little opportunity to calculate a present net value or benefit/cost ratio. However, economic efficiency was a consideration throughout their development. During Forest Plan implementation, the analysis of projects will continue to evaluate the cost efficiency of the standards and guidelines on a site-specific basis.

Following the resolution of the analysis area stratification scheme (see "Analysis Areas," earlier in this appendix), the process of developing FORPLAN prescriptions was initiated. Developing the prescriptions required the derivation of timber yield tables, other resource yield coefficients, and the economic costs and benefits associated with each FORPLAN prescription. The prescriptions were designed to enable FORPLAN to analyze the timber, wildlife, fish, soil, and recreation related outputs and effects associated with alternative land allocations and multiple-use objectives.

How FORPLAN Was Used

Resource models, like FORPLAN are tools which do not conclusively determine the ultimate planning decisions. Models are useful for processing large quantities of data, but establishing relationships between models and decisions to be made requires judgment. The discretion of Forest Service managers is completely retained in making the decisions.

FORPLAN was used to analyze the production and economic tradeoffs between recreation, timber, visual, and wildlife resources on the Forest. Additionally, tradeoffs between Forest capital investment and return to the Treasury were assessed. The model was utilized to analyze the most economically efficient schedule of timber activities and outputs associated with the achievement of the multiple-use objectives of an alternative. The prescriptions chosen by the model depended upon the objective function and the set of constraints used to represent a particular benchmark or alternative. The objective functions most commonly used were maximize present net value or maximize timber production.

Each objective function was optimally achieved based on the data present in the model and after satisfying all the specified constraints. Constraints were designed to represent land allocations and minimum or maximum output levels necessary to achieve the objectives of a

benchmark or alternative. The constraints attempted to provide allocations and activity schedules which were spatially and temporally feasible. Following is a list of the types of constraints used:

- Constraints on timber harvest flows, rotation lengths, ending inventories, and harvest dispersion
- Wildlife habitat constraints
- Land allocation constraints for analysis areas
- Watershed impact constraints
- Riparian area constraints
- Visual management constraints

During the development of the DEIS, the Forest constructed a model using FORPLAN, Version I. This model provided the interdisciplinary team with FORPLAN results used in evaluating tradeoffs and the outputs and effects of benchmarks and alternatives reported in the Analysis of Management Situation and Draft Environment Impact Statement documents. Following publication of the DEIS, the Forest began to evaluate using FORPLAN Version II. The Version II model contained more powerful features than Version I for incorporating multiple-use prescriptions into the analysis process and could be operated on either a mainframe or microcomputer platform.

Following an evaluation of the added advantages to be gained by using the more powerful Version II capabilities and the cost savings and operating efficiencies gained on the microcomputer, the interdisciplinary team decided to convert to FORPLAN Version II for the FEIS model. In May of 1990, the Forest began construction of a Version II model. Version II FORPLAN was used for all analysis performed for the FEIS including rerunning benchmarks, performing sensitivity analyses, and running all the alternatives.

FORPLAN was used to develop benchmarks for the Analysis of the Management Situation (AMS). Maximum resource and economic production levels were determined using the objective functions and constraints discussed above. Allocations and activity schedules which maximized net economic returns were calculated. The FORPLAN model was also used to estimate the tradeoffs in costs, outputs, and benefits associated with legal and policy requirements, such as Management Requirements (MRs), and to test the sensitivity of allocations and activity schedules to changes in assumptions and data such as timber stumpage price trends. Information from the benchmark analysis was used to determine the "decision space" available to the interdisciplinary team for constructing alternatives. Between the DEIS and FEIS, a subset of the AMS runs were re-examined to determine how changes to the model may have altered the "decision space". These differences are discussed in Appendix B - Analysis Prior to the Development of Alternatives.

With information from the benchmark analyses, the interdisciplinary team proceeded to develop a range of alternatives to address the issues, concerns, and opportunities. Each issue, concern, and opportunity was addressed in the alternatives either through land allocations, harvest scheduling, standards and guidelines, or policy statements. Alternatives were modeled through the specification of an objective function and a set of constraints necessary to achieve the intent of a particular alternative.

Analysis in Addition to FORPLAN

In the FORPLAN model, a number of the direct outputs and effects associated with each alternative were calculated by the model itself. However, since many of the outputs did not directly affect the model solution, these outputs were calculated outside FORPLAN based on information derived from each FORPLAN run.

Some of the outputs in FORPLAN were adjusted outside the model to take account for influences which were either non-linear in nature or difficult to model correctly in FORPLAN. For example, road construction estimates were adjusted to account for development of arterial and collector systems and entry into roadless areas. And, estimates of fire protection costs included historical information that adjusted the FORPLAN outputs used in those calculations.

Sometimes the results from one of the additional analyses indicated the need to do more FORPLAN runs in order to improve upon the overall schedule of outputs and effects of a particular alternative. Sometimes the need was apparent to develop another alternative. Once the team was satisfied with the outputs and effects of the alternatives, their implications with regard to income and jobs in the local economy were analyzed with the IMPLAN Input/Output Model (see Appendix B - Social and Economic Impact Analysis).

In order to estimate the environmental effects of the alternatives, the interdisciplinary team discussed the relationship between management activities and the environmental components. In addition, the effects of each component upon other environmental components were estimated including the management activities of other landowners. Using the results of the analysis, the team evaluated each alternative to determine the direct, indirect, and cumulative effects from the level of manage-

ment activities unique to each alternative. The results of this effort are found in Chapter IV of the FEIS.

In the final step, the interdisciplinary team along with the Forest Management Team and other District personnel evaluated how well each alternative addressed the issues, concerns, and opportunities identified at the outset of the planning process. Based on the analysis, a Preferred Alternative was recommended to the Regional Forester.

Identification of Prescriptions

Prescription identification and the subsequent development of management prescriptions is one of the most important phases of Forest planning. It is this process that links Forest management activities, their resulting outputs, and economic and environmental effects, to the planning issues, concerns, and opportunities. In order to develop these linkages, prescription identification and development required the formulation of management strategies and management prescriptions which, in turn, provided the necessary information to generate FORPLAN prescriptions.

A Management Strategy is:

"A specific set of management practices appropriate for application to Forest lands or resources. The management strategy defines the management goals or objectives, standards and guidelines, resource priorities, and intensities to be considered." (Regional Direction, November 10, 1983.)

The National Forest Management Act (NFMA) regulations define Management Prescriptions as:

"Management practices selected and scheduled for application on a specific area to attain multiple use and other goals and objectives." (36 CFR 219.3.)

A FORPLAN prescription refers to a schedule of management activities, costs, and yields explicitly represented in the FORPLAN model by a management emphasis and intensity.

A management strategy consists of a goal statement that defines the overall multiple-use management direction a particular strategy provides. It identifies the categories of lands where the strategy is applicable and defines the desired future condition of the land. The characteristics of the vegetation, the visual appearance of the land, and the types of opportunities a Forest visitor may find in that future condition are also described. The management strategy also contains direction for the implementation on the ground. These standards and guidelines represent the mitigation and resource coordination measures necessary to achieve the multiple-use objectives of the strategy and meet existing laws, regulations, and policies. Strategies were constructed within the requirements specified in 36 CFR 219.27, the implementation, monitoring, and evaluation of Forest Plans with regard to:

- Resource protection
- Vegetative manipulation
- Silvicultural practices
- Even-aged management
- Riparian areas
- Soil and water
- Diversity

Management prescriptions are management strategies applied to a particular piece of land. This tie to the land allows for constructing the specific scheduled technical coefficients for the activity costs, outputs, and environmental effects resulting from the multiple-use management activities, of a strategy, in the FORPLAN model.

The process of identifying and subsequently developing management strategies began with an interdisciplinary team review of the Issues, Concerns, and Opportunities (ICOs). Management strategies and their associated standards and guidelines were developed to address the ICOs. Management prescriptions and constraints were then constructed to achieve the goals and objectives for each management strategy. Other ICOs were addressed through policy statements which did not require management strategies.

Scheduling and land allocation related ICOs were addressed with the FORPLAN model. Technical coefficients for outputs and effects were constructed for the appropriate FORPLAN prescriptions. The model was used to evaluate the implications of alternative scheduling and land allocation choices with regard to addressing the ICOs. The goal statements for each management strategy were designed to respond to the questions raised by the ICOs. The interdisciplinary team used professional judgment, evaluated existing policy, legislative direction, and research for guidance in developing the strategies and related management prescriptions. In addressing the above criteria, the resulting set of strategies represented a broad range of resource management emphasis, practices, and capital investment levels. Forestwide standards and guidelines were also written by the interdisciplinary team to cover practices common to all prescriptions and resource management situations.

In some cases, the management strategies developed were required by Regional direction such as a visual management strategy and a riparian strategy. Other strategies were designed to meet MRs for wildlife and fisheries.

The process of designing management prescriptions was also guided by the following criteria: (a) prescriptions should be achievable and contain realistic practices, (b) they are to be general enough to accommodate the variable conditions on the ground, (c) they should be specific enough for the interdisciplinary team to develop accurate resource and economic output and effects coefficients, and (d) to the extent practicable, they should be the most cost effective means of achieving the intent of the prescriptions.

In order to explore a wide range of alternative ways to manage the Forest for its multiple uses, the interdisciplinary team identified the capability of each analysis area to produce certain goods and services that were being analyzed within the FORPLAN model. All prescriptions which were related to the production of goods and services capable of being produced from an analysis area were then assigned to it. The assignment criteria focused primarily on the geographical, physical, and biological characteristics of the analysis area as related to its ability to provide different types of recreation, visual, wildlife, and wood products.

Depending on the capability of the land and the objectives of the management strategy and standards and guidelines, one to several management intensities were also assigned to each management emphasis in the FORPLAN model. Each intensity represented a different schedule of activities which resulted in different levels of costs, outputs, and uses that were consistent with the strategy. The management intensities or timber options are discussed in greater detail later in this section.

Another important element in the prescription development process is the role of Visual Quality Objectives (VQO) and Recreation Opportunity Spectrum (ROS). A requirement in the planning process is that every acre of land has a ROS class and a VQO assigned to it. Since each management strategy also has an associated VQO and ROS class, this allows the Forest to directly assess the VQO/ROS from the acres assigned to management strategies.

Once the alternatives were developed and the management strategies were assigned to the land, these areas were referred to as "Management Areas". A more complete description of management areas is contained in Chapter II of the FEIS. Also, Chapter 4 of the Plan includes a discussion of their relationship to standards and guidelines.

Management emphasis information is represented by codes used in the FORPLAN Level 7 identifier. The FORPLAN codes determine the rotation age, rate of harvest, and other constraints based on the goals of management areas. The relationship between management areas and FORPLAN Level 7 codes is illustrated in Table B-2. Note that the same management emphasis is assigned to different management areas. In many instances, differences between management areas were not recognizable in the FORPLAN model. For example, wildlife strategies which do not permit timber harvest such as spotted owl and pileated woodpecker strategies are aggregated in FORPLAN. However, the differences will be recognized during project implementation. A summary of management area goals can be found in Charter II of the FEIS. Additional information on management prescriptions is contained the planning records on file in the Mt. Hood Supervisor's Office.

Financial Analysis of Lands Tentatively Suitable for Timber Production

NFMA regulations require that a financial analysis (Stage II Analysis) be performed on the lands which are identified as tentatively suitable for timber production (CFR 219.14(b)). A special FORPLAN run was formulated to only account for costs and benefits associated with timber management (FSH 2409.13). Using a computer program developed by the Regional Office, the PNV of each prescription choice was extracted from the MATRX-RX FORPLAN file. This information was input into a database program for further analysis. The range of these values is displayed in Table B-3.

The PNV of an individual stand is determined by many factors. The values displayed in Table B-3 show a large difference within and between working groups. The variances between lowest and highest values reflect differences in the size and stocking of the existing stands. Low values are associated either with nonstocked lands or stands that have been recently established and will not be harvestable for several decades. The future returns from these stands are highly discounted and are reduced by costs of stand management. The high values reflect timber stands with high volumes that are ready to be harvested.

PNV also varies by working group. The Western Hemlock and Pacific Silver Fir Working Groups comprise over 74 percent of the total tentatively suitable timber lands and are dominated by high value species, especially Douglas-fir. The Grand Fir Working Group includes some areas that never produce a positive PNV. These are nonstocked lands on poor growing sites and encompass less than one percent of the tentatively suitable land area. The complete results of the State II analysis including the effects of management intensity can be found in Timber Financial Analysis in the Forest planning records.

Table B-2 Identification of Management Prescriptions

Management Areas	FORPLAN Level 7 Identifers
Category A Management Areas 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. The goals for individual "A" management areas can be found in Chapter II of the FEIS.	ML- Minimum Level (no timber harvest) Many of these lands are not modeled in FORPLAN since they prohibited timber harvesting. The lands that are modeled in FORPLAN received a minimum level prescription.
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.	Depending on the VQO for a particular river segment these prescriptions are used: ML- Minimum Level (no timber harvest) VR- Visual Retention (foreground or middleground) FP- Foreground Partial Retention MP- Middleground Partial Retention
Management Area B-2 - Scenic Viewsheds The primary goal is to provide Forest visitors with attractive scenery.	Depending on the VQO for a particular viewshed these prescriptions are used: ML- Minimum Level (no timber harvest) VR- Visual Retention (foreground or middleground) FP- Foreground Partial Retention MP- Middleground Partial Retention
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.	FP- Foreground Partial Retention
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.	PO- Pine/Oak Wildlife Area
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.	Half of each habitat area is allocated to: ML - Minimum Level (no timber harvest) The other half of each habitat area is allocated to prescriptions based on the underlying management areas.
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.	SE- Special Emphasis Watersheds and Earth Flow Areas

Table B-2 Identification of Management Prescriptions (continued)

Management Areas	FORPLAN Level 7 Identifiers
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.	80% of the riparian areas are allocated to: ML- Minimum Level (no timber harvest) The other 20% is allocated to prescriptions based on the underlying management areas.
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.	SE- Special Emphasis Watersheds and Earthflow Areas
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.	Depending on the VQO for a particular viewshed these prescriptions are used: ML- Minimum Level (no timber harvest) VR- Visual Retention (foreground or middleground) MP- Middleground Partial Retention
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 Rock 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.	WR- Deer and Elk Winter Range
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.	SR- Deer and Elk Summer Range
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.	VR- Visual Retention (foreground or middleground)
Management Area C-1 - Timber Emphasis The primary goal is to provide 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.	TM- Timber Management

Table B-2 Identification of Management Prescriptions (continued)

Management Areas	FORPLAN Level 7 Identifiers
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 portable 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.	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. Prescriptions used include: ML- Minimum Level (no timber harvest) SE- Specail Emphasis Watersheds and Earthflow Areas VR- Visual Retention (foreground or middleground) FP- Foreground Partial Retention MP- Middleground Partial Retention TM- Timber Management
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.	ML- Minimum Level (no timber harvest or unregulated harvest volume)

Table B-3 Range of Contribution to Present Net Value by Working Group

Working Group	Lowest Value($)	Highest Value($)
Western Hemlock	106	10,100
Pacific Silver Fir	24	9,120
Mountain Hemlock	3	1,960
Grand Fir	-68	1,160

Development of Timber Options and Timber Yields

Regional direction for selection of timber management intensities was to have at least four intensities, including one that maximizes wood production, one that maximizes present net value, a final harvest only option, and a no harvest option (Sirmon, 1983). These options are also represented by different regimes of fertilization and thinning with different harvest timings. Some of these regimes which proved to be ineffective in meeting management objectives or produced outputs and effects similar to other regimes but at higher costs were eliminated from the FORPLAN model.

Yield coefficients were developed for all management strategies and analysis area combinations which permitted regulated timber harvest scheduling. Empirical yield tables were developed for existing sawtimber stands. Managed yield tables were developed and used for existing plantations, non-stocked conditions, and future managed stands. Each is discussed separately in the following sections.

The development of timber yield tables was an important step in the Mt. Hood National Forest planning process. They are a component of the FORPLAN model which is used to calculate the Allowable Sale Quantity, long-term sustained-yield capacity, and the schedule of timber harvest activities. The yield tables were reviewed at several points. Initial review was made by Forest personnel who compared the tables with their personal experiences on the ground. Other reviews were made by the Regional Office, the State of Oregon, and industry representatives.

The empirical yields were developed under the direction of John Teply, the regional biometrician, according to the empirical yield process for Region 6 (Teply, 1976). Managed yields were developed using three simulation models, DFSIM, DP-DFSIM, and PROGNOSIS (Daoust, et al 1990).

The following is a brief explanation of process and assumptions used in the development of the timber yield tables.

The Vegetative Resource Inventory

The process for determining timber options and yields begins with the Forest's vegetative inventory. A matrix was developed which consists of different combinations of vegetative condition. Using information from the Total Resource Inventory (TRI) database, photo interpretation, and field verification, each acre was assigned a matrix number describing its vegetative condition. The forested component of the matrix was delineated by working group, primary species, size class, and stocking level. The working group is analogous to an ecozone or climax conifer species zone. The size classes represented in the matrix included large and small sawlog, poles, seeds and saps. The stocking levels include high, medium and low. The matrix also separated acres based on whether they have received past management.

A definition of each Working Group follows:

Western Hemlock Working Group

This working group comprises 198,050 acres or 29 percent of the tentatively suitable forest land on the western slope of the Cascades. Stands are usually dominated by Douglas-fir or western hemlock, but western red cedar, silver and noble fir, western yew, grand fir, big leaf maple, and red alder are common. Precipitation ranges from 60 to 120 inches per year and temperature conditions allow for greatly enhanced growing conditions.

Silver Fir Working Group

This group is found primarily on the western slope of the Cascades, generally at higher elevations than the Western Hemlock Working Group. It comprises 307,400 acres, or 45 percent of the tentatively suitable forest land. Annual precipitation ranges from 70 to 140 inches per year. At least sixteen conifer species are present, and at times it is transitional in nature between high and low elevation plant communities.

Mountain Hemlock Working Group

This working group straddles the Cascade mountain crest, and comprises 50,550 acres, or 7.5 percent of the suitable forest land base. This group is found primarily at high elevations, where the growing season is short. Mountain hemlock can grow in pure stands but is usually found in mixed species stands along with Pacific silver fir, subalpine fir, noble fir, western white pine, Engelmann spruce, lodgepole pine, and Douglas-fir.

Grand Fir Working Group

The grand fir component encompasses most of the mid to high elevations of the eastern slope of the Cascades. It comprises 116,100 acres, or 17 percent of the tentatively suitable forest land. Most stands are dominated by Douglas-fir and grand fir, but may contain varying amounts of ponderosa pine, western larch, Engelmann spruce, lodgepole pine, western white pine, and Oregon white oak. Frequent occurrence of pathogens associated with a warm, moist environment limit management opportunities.

Eastside Douglas-fir Component

This component is found in the lower elevations along the eastern-most portions of the Barlow and Bear Springs Ranger Districts. Ponderosa pine may be the dominant species, but Douglas-fir is a major species, with incidental amounts of grand fir and Oregon white oak present in some natural stands. This component is usually more productive than either the Separate Suitability Component (see below) or Ponderosa Pine Component but less productive that the balance of the working group.

Ponderosa Pine Component

This component is found in the lower elevations along the eastern-most portions of the Barlow and Bear Springs Ranger Districts. Oregon white oak is a minor component, and stands are dominated by ponderosa pine, with incidental amounts of Douglas-fir in natural stands. Ponderosa pine is the preferred species for regeneration.

Separate Suitability Component

This component was created for certain eastside stands where oak comprised less than 50 percent but where moisture is limiting and regeneration of coniferous species is extremely difficult. This component is usually found at low elevations on the extreme east side of the Barlow Ranger District. It comprises 6,350 acres or less than 1 percent of the land base.

The size class delineations were based on the trees which contribute the majority of basal area. A definition of the size classes follows:

Large sawlog	greater than 21" dbh
Small sawlog	8 to 21" dbh
Natural poles	less than 8" dbh and greater than 20' tall
Managed poles	pole-sized timber currently under management
Saplings	4.5 to 20' tall
Seedlings	10 to 39 percent stocked

The following is a definition of stocking level:

High	70 to 100 percent stocked
Medium	40 to 69 percent stocked
Low	10 to 39 percent stocked

Empirical (Natural) Opportunities and Yields

The matrix was collapsed further into an inventory model, which allowed combinations of similar management capabilities to be sampled together. A Vegetative Resource Survey (timber inventory) (Teply, 1986) of 544 field plots was performed in 1986. This inventory sampled natural stands in four out of the five working groups and all other components except pole-sized timber of low stocking. Using statistics from this inventory for all field plots measured outside of the Bull Run Watershed, 23 empirical yields were developed representing the entire natural stand component. The inventory strata were collapsed into 23 tables due to insufficient acreage in some inventory strata, unsampled inventory strata, and FORPLAN model size constraints. Each yield table was updated to represent the volume at the midpoint of the first planning decade. Sixteen separate empirical yields were developed for the Bull Run Watershed.

Adjustments to Empirical Yield Tables

The inventory measured volume in gross cubic feet and gross board feet per acre. FORPLAN requires these to be converted to net figures, removing both defect and breakage. Historical sale data was used, to develop gross to net coefficients for each model component. These coefficients range from 0.7149 to 0.9085 and were applied directly to the cubic foot values in the empirical yield tables. Historical sale data was also used to

develop board foot/cubic foot ratios for each model component. These coefficients, which ranged from 5.11 to 6.69, were incorporated into FORPLAN so the model can report harvest volume in both net cubic feet and net board feet. A green tree reduction of 2-5% was made for wildlife tree purposes. A complete display of this information is found in the yield table documentation.

Managed Stand Opportunities and Yields

As natural stands are harvested, the land is placed under management. The future yields from these lands vary by working group and site index. Therefore, managed stand yield tables are linked to the empirical stands through the inventory matrix. The stand simulators DP-DFSIM and DFSIM (Curtis, et al 1981) were used to build tables for the westside working groups. DP-DFSIM built the basic tables and DFSIM was used to model extended rotations. The PROGNOSIS (Wykoff, 1986) stand simulator was used for eastside working groups.

These simulators were used to develop a set of yield tables for each managed stand that reflect various management objectives and the various ways of achieving those objectives. The simulators incorporate a number of assumptions covering growth characteristics, management goals and constraints, and silvicultural practices. Each yield table contains a set of these assumptions and may be selected in FORPLAN to help meet the objectives of a particular alternative or benchmark run. Briefly, the assumptions used in managed yield table development include:

- Site index
- Minimum merchantable tree
- Initial stand densities
- Natural regeneration
- Height/age relationships
- Minimum sale quantity
- Age of precommercial thinning
- Fertilization
- Decline for advanced ages
- Regeneration lag
- Relative density
- Herbicide use
- Openings
- Genetics
- Defect and breakage
- Commercial thinning frequency and size
- Economic assumptions

Refer to the Mt. Hood Yield Table documentation of a more complete discussion of each of the assumptions and yield development.

Adjustments to Managed Yield Tables

A number of timber volume adjustments were made to the managed yield tables. These included the following:

- A 10% genetic gain on 90% of the acres.
- Between 2-5% falldown due to the green tree requirement for wildlife purposes.
- A 10% falldown due to natural openings.
- Animal and disease damage was included in the amount assumed for unstocked openings.
- A reduction in the PROGNOSIS modeled components due to competition with Oregon White oak.

An uneven-aged management table was also developed and applied to the ponderosa pine under some management strategies. Also, a separate suitability component consisting of harsh eastside lands had empirical and managed yields developed addressing its unique management requirements.

Existing Managed Stands

Managed stands that exist now would enter a given managed stand yield table at its current age, based upon its management history.

Silvicultural Requirements

An analysis of benchmark results found that certain silvicultural intensities were not being selected by FORPLAN. Some of these intensities contain practices that are necessary to implement prescriptions related to specific management areas. In these cases FORPLAN was "instructed" to select this required intensity for a certain number of acres. For example, FORPLAN was constrained to selected a natural regeneration regime in 15 to 25 percent of all harvested areas in the Pacific Silver Fir working group, mixed or miscellaneous species. These percentages were determined by an interdisciplinary task force. Further analysis of FORPLAN outputs showed that these changes were insignificant to the allowable sale quantity (ASQ) or the long-term sustained yield (LTSY). Therefore, these modeling requirements were dropped from FORPLAN. This does not preclude the use of these silvicultural regimes in actual practice,

just that from a modeling standpoint they are unnecessary.

Other Timber Opportunities and Volume

The allowable sale quantity (ASQ) is the amount of merchantable green timber harvestable as represented by the yield tables discussed above. There are other sources of volume that are either in lieu of or in addition to the live ASQ.

Catastrophic Mortality Salvage

The volume of mortality sold from catastrophically killed stands of timber that were part of the growing stock at the time of inventory. These sales replace sales of live timber, and are chargeable against annual allowable sale quantity. Due to the unpredictability of catastrophic events, the amount of this volume cannot be estimated.

Mortality Salvage

This is incidental and/or endemic mortality that commonly occurs and is estimated during inventories. This inventoried volume is discounted from the gross volume of growing stock. Sale of this volume is represented as an addition to the allowable sale quantity.

Per Acre Material

This is volume such as cull material, material from rough trees, noncommercial products, nonstandard sized trees, and unregulated species. This includes fuelwood, shakes and bolts, and other such products. This is available volume in addition to the allowable sale quantity.

Other Live Volume

This is volume of live timber from the unregulated component including volume from administrative sites, campgrounds, and other noncommercial forest lands. This is available volume in addition to the allowable sale quantity.

Total Sale Program Quantity (TSPQ)

Historically, the amount of volume made available for sale in addition to the ASQ volume has been 11 to 17 percent of the ASQ. With more comprehensive standards and guidelines that specifically address amounts of the volume to be left on site for other resource needs, the total sale program quantity (TSPQ) is estimated to be the ASQ plus 14 percent.

Development of Yield Coefficients

Transportation

Paper transportation plans were developed to locate non-accessed areas on the Forest. After these areas were identified, a transportation plan was developed to determine the miles of new construction required to fully road the area to accommodate timber related activities. The non-accessed areas and a slope class map were entered into the Forest GIS.

A portion of the harvest acres from each FORPLAN run were assigned to each slope class and to an accessed or non-accessed category. This assignment was based on the percentage of each analysis area in those categories. For each alternative, maps were overlaid to display the non-accessed areas, large and small sawtimber, and land allocations that do not allow harvest activities. From these maps, the percentage of each non-accessed area which has harvestable acres was determined. Using these percentages, the original paper transportation plan was consulted and appropriate miles of new construction was calculated.

For accessed areas, a factor based on the last two year's planning process was developed to determine miles of new construction.

Reconstruction miles were developed for two classes of roads, local/minor collectors (single lane, gravel surface) and arterial/major collectors (single or double lane, paved surface). Local road construction was based on a factor developed over the last 10 years. This factor is a ratio of miles of reconstruction divided by millions of board feet harvested. Arterial/major collector reconstruction was based on historic trends to reconstruct these improvements on a 15 year cycle.

Miles of road, by road maintenance levels, were developed for each alternative based upon the emphasis of that alternative, as well as road management strategies for different management areas.

Sediment

The sediment index is a broad indicator of how much erosion is happening in a given area. The index reports in thousands of tons of delivered sediment and appears to be an actual output. However, it functions as an index and not as an absolute sediment value. As a relative measure of sediment produced and delivered to streams, the index consists of two parts. One part is the potential for soil to erode -- its erodibility coefficient. The second part is the potential for eroded soil to be delivered to streams as sediment -- the delivery coeffi-

cient. The index does not include the possible contributions of destabilized earth flows or any reduction in delivery due to riparian management practices. These sediment delivery estimates were calculated in the FORPLAN model. No constraints were applied directly to sediment delivery.

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 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 and discussed in Chapters II and IV of the FEIS.

While derived from somewhat different methods, the two values are consolidated as the total sediment delivery index to provide comparative differences between alternatives and trends over time within individual alternatives. The sediment index is used to help assess impact trends between alternatives. However, the model and resulting index values were not designed to determine absolute effects of alternatives.

Fish Habitat and Water Quality

A simple model, the Aquatic Habitat Stability Index, was 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.
- Total acres assigned to one of three riparian management strategies.
- Acres of other land allocations having high compatibility with riparian 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 Forestwide and drainage specific 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.

Wildlife

Potential wildlife population levels, or habitat capabilities, for indicator species were calculated using FORPLAN outputs for each alternative and benchmark. Data from the Forest vegetative inventory and habitat capability coefficients for each vegetation type and age class were the basis for determining overall habitat capabilities for each indicator species.

Spotted Owl

The spotted owl network consists of 66 mapped spotted owl habitat areas (SOHA's), each having at least 1500 suitable habitat acres. All alternatives (except the No Change alternative) dedicated at least 1500 acres per SOHA (USDA, 1988).

Pileated Woodpecker and Pine Marten

MR habitat areas for these species were mapped, using Regional Guide spacing, size, and habitat suitability criteria (USDA, 1984). All alternatives (except the No Change alternative) included these MR areas as a minimum. Habitat capability levels above the MR level were based on suitability coefficients for mature and old-growth habitat.

Cavity Excavators

The Snag Recruitment Simulator (Marcot, 1988) and timber yield tables were used to determine the snag levels and sizes present in each vegetation type and forest age class, under both managed and unmanaged conditions. The woodpecker guild on the Forest, as the representative species for the cavity excavator group, was used to determine the snag levels and sizes required for each category of forest condition described above. The woodpecker guild was selected because it requires the largest snag (15 inches dbh) of the cavity excavators.

Merriam's Turkey and Silver-Gray Squirrel

Turkey and squirrel habitat areas were mapped and a coefficient was developed for habitat capability, based on areas of contiguous pine/oak habitat on the eastern portion of the Forest. This area will also serve to maintain critical big game habitat. Current population estimates were obtained through personal communication with Department of Fish and Wildlife biologists.

Deer and Elk

Deer and elk winter range habitat capabilities for the Forest were determined through the development of

habitat effectiveness indices. These indices determine the quality of deer and elk habitat on winter range (Wisdom et al 1986) and were based on quantity and quality of cover and forage, road densities, and dispersion of cover and forage. The indices were calculated for present and future conditions based on FORPLAN estimates and management area standards and guidelines for the following variables: dispersion of cover and forage, quality of cover, quality of forage, and road density. Actual habitat capability (the number of deer and elk that would be supported) was estimated using these habitat effectiveness indices combined with Forest, District, and Department of Fish and Wildlife biologist estimates of deer and elk densities under different habitat conditions.

For the calculation of cover quality, it was assumed that old-growth and older-mature stands provide mainly optimal cover, stands greater than 40 years provide mainly thermal cover, stands 11-39 years provide mainly hiding cover, and stand less than 11 years provide mainly forage.

For the calculation of forage quality, projected silvicultural prescriptions and forage enhancement projects were based on district personnel's predictions as well as FORPLAN outputs.

For the calculation of dispersion for cover and forage, estimates were made based on the different land allocation emphasis in each alternative.

For the calculation of road density, estimates by Forest engineers as well as standard and guidelines were used.

Range

This analysis determined range outputs for each alternative by estimating Animal Unit Months (AUMs) over 5 decades. The calculation was based on the acres FORPLAN harvested by decade for each major drainage, the acres of permanent range on the Forest, and the estimated pounds of forage produced per acre on various vegetation types. The main sources of data for this analysis were basin maps, allotment maps, and the vegetation inventory.

Recreation and Wilderness Use

This section summarizes the process used to develop expected Recreation Visitor Day (RVD) outputs.

Current annual use, in RVD's, was determined for developed sites, Wildernesses, and other dispersed areas on the Forest. It provided a baseline from which to project future use based on demand.

Demand for Wilderness and other dispersed recreation was determined using Statewide Comprehensive Outdoor Recreation Plan (Oregon State Parks and Recreation Division, 1988) growth figures based on the Pacific Northwest Demand Survey. From this data, growth rates were calculated for each ROS class and projected growth was estimated through the fifth decade. For developed recreation, the DEIS assumptions were used. It was assumed that demand would follow population growth, recognizing that individual activities grow at different rates and that some activities will exceed supply while others may not meet it.

Using a 1984 inventory of the Recreation Opportunity Spectrum (ROS) and the Wilderness Resource Spectrum (WRS), an ROS class was assigned to management areas based on their desired future condition.

Wilderness capacity is fixed, except in alternative I which recommends the Olallie Further Planning Area for Wilderness designation. Wilderness capacity was based on Wilderness Resource Spectrum (WRS) coefficients of RVDs/acre/year. These coefficients are based on criteria for numbers of encounters with other users, degree of solitude, amount of Forest Service contact/administration, type of trail system, and the camping experience. Dispersed recreation capacity was based on ROS coefficients of RVDs/acre/year. These coefficients were applied to the acreages in each management area for each alternative. DEIS assumptions were used for developed recreation supply estimates. These assumptions were based on the practical capacities of each developed recreation development. Forest capacity is the sum of individual sites, including privately owned sites.

For each Roadless Area the boundaries and acreage were updated, timber information was estimated, acres remaining roadless were identified, and wilderness potential was evaluated. The roadless area boundaries and acreage were updated current with the 1988 vegetative inventory. See Appendix C for further information.

Scenic Quality

The future visual conditions were estimated using information entered into the GIS. A map layer containing the inventoried sensitivity level 1 viewsheds was overlaid on the management area map for each alternative. This created a list for each alternative showing how many acres of level 1 viewsheds occur in each management area. Since each management area has a Visual Quality Objective (VQO) in the standards and guidelines, the future visual condition of the viewshed was estimated by calculating the percent of each viewshed which would be potentially altered to the limits of the various VQOs.

The estimate of Forestwide visual quality outputs was obtained by taking the visual quality objectives from the standards and guidelines for each management area, and applying them to the total acres allocated to each management area in each alternative. The total of each of five visual quality objectives was then summed for each alternative.

Cultural Resources

Relative outputs for future years are predicted from the averages of cultural resource work produced in the past. These outputs have been used to develop the cultural resource component in each alternative. Changes in relative outputs and the quality of cultural resources are expected to vary by alternative largely in response to the outputs of other resources. Accurate outputs are not easily predicted at this stage of forest planning because the cultural resource data are far from complete. However, specific outputs, such as the number of acres inventoried and number of sites recorded, are measured through annual program monitoring and accomplishment reports.

Economic Efficiency Analysis

This section explains and defines the costs and benefits involved in economic efficiency analysis, how the values were derived, and how they were used in the forest planning process. Economic efficiency analysis is required by the National Forest Management Act Regulations (36 CFR 219) and played an important role in the development and evaluation of forest planning benchmarks and alternatives. Specifically, the Regulations (36 CFR 219.12(f)(8) state that:

Each alternative shall represent to the extent practicable the most cost efficient combination of management prescriptions examined that can meet the objectives established in the alternative.

Description Of Concepts

Before explaining the specifics of how economic efficiency analysis was used in the development of the Mt. Hood National Forest FEIS and Forest Plan, a few concepts and terms related to efficiency analysis in general need to be explained.

Priced Outputs

Priced outputs are goods or services which can be exchanged in the market place. The quantitative values are determined by actual market transactions or by estimation methods that produce prices commensurate with those determined by market transactions. Timber and forage are examples of commodities which are bought and sold in the market. Their values are determined through the interaction of buyers and sellers based on the supply and demand conditions in the market at the time of the transaction. Dispersed recreation uses, on the other hand, are not normally exchanged as market transactions. Their market values are estimated by using some market transaction data in combination with various theoretical techniques. Conceptually, these assigned values should be consistent and comparable to those values which were actually derived via market transactions (Rosenthal et al., 1985). Therefore, both assigned and market values for priced outputs are appropriate to use for calculating quantitative measures of efficiency such as present net value.

Non-priced Outputs

Non-priced outputs are outputs which have no available market transaction evidence and no reasonable basis for estimating a dollar value commensurate with the market values associated with the priced outputs. The values are qualitatively rather than quantitatively described and they may be either positive or negative. In fact, what may be considered to be a benefit to someone may represent a cost to someone else. Examples of non-priced outputs include the maintenance or enhancement of threatened and endangered species, natural and scientific areas, and historical and anthropological sites.

Discounting

Financial analyses of alternative investment options usually involve cash flows over different periods of time. There is a time value associated with money, since there is a propensity to consume now. A dollar today is worth more than a dollar 10 years from now. Discounting is a process for adjusting the dollar values of costs and benefits which occur at different periods to dollar values for common time period so they may be compared. Usually the common time period is the present. In which case, the discounted cash flow is referred to as the present value.

Present Net Value

Present Net Value (PNV) is the difference between the discounted value (benefits) of all outputs to which monetary values or established prices are assigned and the total discounted costs of managing the planning area. The maximization of present net value was the criterion used to help ensure each alternative was the most economically efficient combination of outputs and activities needed to meet the objectives established for the alternatives. Present net value calculations consider only the benefits for which market prices exist or can be assigned. On the Mt. Hood, the priced benefits included timber, recreation, wildlife, fisheries, and range. The benefits were compared against all Forest Service fixed and variable costs associated with managing the planning area, regardless of whether the costs were incurred for the production of either priced or non-priced outputs, or as overhead expenses for general maintenance of the organization. Therefore, PNV is an estimate of the current market value of the priced forest resources after all costs of producing both priced and non-priced outputs and meeting other multiple-use objectives have been considered.

Opportunity Costs

Opportunity costs are defined as the value of a resource's foregone net benefit in its most economically efficient alternative use (FSM 1970.5). In relation to the economic analysis performed for forest planning, it represents the decrease in maximized PNV of an alternative when some alternative level of resource outputs are forced into solution. Therefore, opportunity costs measure the change in PNV for priced resource outputs, and can be used to measure the relative value traded off in order to produce the non-priced outputs.

Net Public Benefits

The maximization of net public benefits while responding to Issues and Concerns is the goal of Forest Planning. Net public benefits is the overall value to the Nation of all outputs and positive effects (benefits) less all the associated Forest Service inputs and negative effects (costs) whether they can be quantitatively valued or not.

Conceptually, net public benefits is the sum of the present net value of priced outputs plus the full value of all non-priced outputs. The full value of non-priced benefits is used because the costs associated with their production is accounted for in the calculation of PNV. The costs of production are noted as increased Forest budget requirements and as reductions in the present net value of the priced outputs. It is important to depict the physical, biological, and social dimensions of the non-priced outputs, as well as who will be affected by changes in their production. Account should also be taken of any changes occurring among the other non-priced outputs as a result of providing a particular non-priced output. In assessing the net public benefits of a particular alternative, non-priced indicators should be evaluated to determine if their value to society exceeds the opportunity cost of their production.

Welfare Distribution Effects And Impacts

Another level of effects which are a concern of National Forest Policy and Management are the welfare distribution effects influenced by the mix and level of outputs produced by the National Forest. The effects can be either positive or negative. The impacts can be local, regional, or national in scope. Some distributive effects such as changes in taxpayer costs have national level impacts. Others, such as induced jobs and income, or payments in lieu of taxes are more local or regional in nature. The effects are more related to questions of equity (i.e. who pays and who benefits) rather than efficiency and are not assessed in the context of the efficiency criteria associated with the PNV. However, the positive and negative distributive effects need to be assessed since equity objectives often influence efficiency objectives.

Parameters And Assumptions Used For Economic Efficiency Analysis

In order to calculate the present net value for each alternative, several assumptions were made regarding discount rates, demand curves, real dollar adjustments, and real price and cost trends. The section will summarize the decisions and the resulting parameters.

Discount Rates Used

Discounting requires the use of a discount rate which represents the cost or time value of money in determining the present value of future costs and benefits. One discount rate was used to calculate the present net value for each benchmark and alternative. A real discount rate was used meaning it was adjusted to exclude the effects of inflation.

As directed by the Washington Office, for evaluations of long-term investments and operations in land and resource management, a 4 percent real discount rate was

used. Evaluations should also discount benefits and costs at the alternate real discount rate used in the most recent RPA to determine sensitivity of alternatives to variations in the discount rate.

The 4 percent rate approximates the "real" return on corporate long-range investments above the rate of inflation (Row et al., 1981). The 4 percent rate was used to solve FORPLAN and calculate the PNV for each benchmark and alternative. All costs and benefits were discounted from the midpoint of the decade in which they were incurred.

Demand Curves And Real Price Trends

As specified by the Washington Office (FSM 1920 letter to the Regional Forester, "Downward Sloping Demand Curves," 2/3/81) and in keeping with FSM 1972.65, horizontal demand curves for timber and nontimber resources were used to analyze the benchmarks and alternatives. Many factors can influence the demand for stumpage from any one forest (Adams et al., 1985). Some of the factors include trends in: 1) interest rates, 2) the species and products mix of forest products consumption, 3) forest products exports, 4) the cost of wood in Canada, 5) the rate of technical improvements in wood and fiber processing, and 6) the levels of other ownerships harvests.

All of the factors contain some degree of uncertainty regarding their future levels and effect. Neither the empirical nor the theoretical bases have been well enough developed to derive reasonable estimates of the demand functions for the resources offered at the Forest level. For purposes of the analysis conducted here, the assumption was made that the amount of total timber offered would not affect the prices paid. In other words, the timber demand curve for the range of output levels analyzed during the development of alternatives is nearly horizontal.

Real price trends were developed and used to represent the rate at which resource values will change over time as a result of anticipated supply and demand interactions in the market place. As specified by the Regional Office (FSM 1920 letter to Forest Supervisors, "Timber Price Trends, Values, and Costs," 9/25/84), a 1 percent per year real price trend for stumpage was used for FORPLAN harvest scheduling analyses. These were applied for the first 50 years, and then a 0 percent price trend was assumed for the remaining 100 years of the planning horizon.

Since price trends are reflections of expected futures, there is an inherent uncertainty involved with making such projections. In recognition of the uncertainty, a sensitivity analysis was performed using alternative stumpage price trends of zero and one percent.

Based on Regional Office direction, a zero percent real price trend for all other resources was used during the development of the benchmarks and the alternatives.

Real Cost Trends

Based on Regional Office direction, zero percent real cost trends were used for all future costs used in the development of the benchmarks and alternatives. In other words, the costs of labor, fuels, materials, and all other factors of production involved with managing the Forest are assumed to remain constant.

Real Dollar Adjustments

Future prices and costs can be expressed in both nominal and real terms. The projection of nominal values includes the effects of inflation on the values. The projection of real values is net of inflation. Real value changes are the result of the interactions of supply and demand forces in the market place and do not include the effects of inflation.

All future values and costs used in the forest planning process were expressed in real 1982 dollars, consistent with the 1985 RPA program. The GNP implicit price deflator index was used to convert nominal prices and costs to the common base (FSM 1971.32b).

Costs Used For Economic Efficiency Analysis

This section describes the costs used to perform economic efficiency analysis for each of the alternatives analyzed in detail for the FEIS.

All Forest Service costs were included for purposes of estimating budgets and calculating present net values for each alternative. Costs were considered fixed if they were not expected to vary significantly over the range of alternatives, could not be tied to specific activities within any of the prescriptions, or represented a very small portion of the budget. Costs were considered variable if they could be said to vary on a per unit basis across alternatives. Only costs directly associated with the production of timber were included in the FORPLAN model.

Table B-4 indicates which costs were modeled as fixed and which were modeled as variable. See the process papers on costs and budget for a further discussion.

Table B-4 Costs Used for Economic Efficiency Analysis

Resource	Operations and Administration	Improvement	Maintenance
Recreation	Variable	Fixed	Variable
Wildlife	Variable		Variable
Fish	Variable		Variable
T & E Species	Variable		Variable
Range	Fixed		Fixed
Timber	Variable		
Watershed & Air	Variable		Variable
Minerals & Geology	Fixed		
Lands	Fixed		Fixed
Facilities	Fixed	Fixed	Fixed
Roads	Variable	Fixed	Variable
Planning	Fixed		
Protection	Fixed		
Administration	Fixed		

Benefits Considered For Economic Efficiency Analysis

This section describes both the priced and non-priced benefits which were incorporated in the economic efficiency analyses for each benchmark and alternative considered during the development of the FEIS. Resource outputs to which dollar values were assigned constitute the priced benefits included in the Present Net Value calculations. Like all of the costs included in the analyses, benefits incurred during the planning horizon were incorporated in the PNV calculations. The economic efficiency analysis for each alternative also considered non-priced benefits. Non-priced benefits are outputs for which there is no available market transaction evidence and no reasonable basis for estimating a dollar value commensurate with the market values associated with the priced outputs. A subjective qualitative value must be attributed to their production. Both priced and non-priced outputs and their associated values will be summarized below.

Priced Benefits Considered

Price benefits fall into one of two categories: market and nonmarket (assigned). The market values constitute the unit price of an output normally exchanged in a market after at least one stage of production, and are expressed in terms of what people are willing to pay as evidenced by market transactions. Nonmarket values constitute the unit price of a nonmarket output not normally exchanged in a market at any stage before consumption, and thus must be computed from other economic information (FSM 1970.5). They are valued in terms of what reasonable people would be willing to pay (above participation costs) rather than go without the output. In either case, the values are theoretically commensurate and appropriate for inclusion in PNV calculations.

The resources for which values were estimated on the Mt. Hood National Forest consisted of timber, range, anadromous fish, and developed, dispersed, and wildlife oriented recreation. Nonmarket prices were used for hunting, anadromous sportfishing, resident sportfishing, and other dispersed recreation activities. The process for deriving each of the values will be briefly explained in the following sections.

Timber Resource Benefit Values

Prices were developed for both existing natural stands and future managed or "second-growth" stands within each Working Group and diameter class. All calculations were performed in terms of constant 1982 dollars. Also, since most of the source data was expressed in terms of dollars/MBF, it was necessary to convert these to dollars/MCF at different steps in the process. The stumpage values were calculated for each individual species sold on the Forest. Since none of the source data was diameter specific, assumptions had to be made regarding the average diameter of trees sold for each species during the period for which the data sources covered. The diameter specific values were then developed based on diameter class relative indices for lumber selling values.

Based on work done at the Pacific Northwest Forest and Range Experiment Station, lumber selling price diameter relationships were used to develop diameter specific stumpage values.

These price diameter relationships were used to develop a set of relative value indices. The indices determined the value of logs in diameter classes that were larger or smaller than the historic average diameter. Based on the percentage of a species within a working group, weighted average value was derived. The process is explained in more detail in the Forest planning records. The values used in the FORPLAN model are displayed in Table B-5.

Table B-5 Stumpage Values by Working Group and Diameter Class

Stumpage Values ($/MCF)					
Diameter Range (Inches)	Western Hemlock	Silver Fir	Mountain Hemlock	Grand Fir	Special Component
0 - 8	0.00	0.00	0.00	0.00	0.00
8 - 10	326.31	312.41	136.10	243.04	243.04
10 - 12	553.31	482.41	238.96	310.32	310.32
12 - 14	693.17	625.21	305.09	390.15	390.15
14 - 16	817.16	732.30	343.59	429.24	429.24
16 - 18	913.66	827.27	366.65	464.88	464.88
18 - 20	1,002.64	888.29	381.11	501.41	501.41
20 - 22	1,036.77	945.88	390.97	544.02	544.02
22 - 24	1,108.11	995.88	396.38	588.48	588.48
24 - 26	1,157.67	1,041.53	401.02	625.85	625.85
26 - 28	1,200.33	1,076.41	405.67	658.53	658.53
28 - 30	1,224.75	1,100.83	404.06	658.21	658.21
30 - 32	1,261.12	1,128.76	404.62	710.83	710.83
32 - 34	1,284.21	1,160.42	402.44	731.35	731.35
34 - 36	1,309.28	1,169.01	400.26	748.36	748.36
36 - 38	1,331.04	1,183.01	395.90	761.37	761.37
38 - 40	1,354.79	1,190.30	393.72	773.48	773.48
40 - 120	1,355.63	1,190.30	389.36	782.90	782.90

Livestock

The range outputs represent the amounts of forage permitted to be grazed and is measured in units of Animal Unit Months (AUMs). AUM values were calculated as the value of the marginal product of an AUM in the production of a marketable animal. The Forest Service entered into a cooperative agreement with the USDA Economic Research Service to develop livestock enterprise budgets for each National Forest. The Ranch Budget Approach was used for the analysis. Because Forest AUMs are not actually priced in a free competitive market, the calculated price is an estimate of market value. The AUM value for the Mt. Hood National Forest, in 1982 dollars, is $5.74.

Wildlife And Recreation Benefit Values

The non-wildlife related recreation and Wilderness recreation represent the amount of use consumed on the Forest and are measured in terms of Recreation Visitor Days (RVDs). The wildlife and fish-related recreation use is measured in terms of Wildlife and Fish Users Days (WFUDs). The values used for the priced outputs were derived directly from the 1985 RPA program assessment. The following discussion is a summary of the write-up found in Appendix F of the 1985 RPA DEIS. These values were included in the PNV analysis but not in the FORPLAN model.

The development of recreation, Wilderness, and wildlife values for the 1985 RPA Program analysis consisted of two steps: (1) development of recreation and wildlife benefit values by activity per RVD or WFUD; and (2) adjustment of values to reflect standard and less than standard levels of management.

The Resource Evaluation Group at the Rocky Mountain Forest and Range Experiment Station conducted an extensive literature search to develop the 1985 activity

values for recreation. Benefit values for recreation, Wilderness, and wildlife activities were developed from recent travel cost models and contingent valuation research (Loomis, 1982). In-service and academic specialists reviewed the research and activity values and adjusted the initial values to achieve methodological consistency to apply them to regional conditions. The RVD values by recreation activity generated by the study can be found in Table F.4 of the 1985 RPA DEIS.

For program evaluation purposes, the values were subsequently adjusted downwards because:

- The travel cost method represents a total willingness-to-pay. Other resource values in the RPA evaluation represent market price or value of the marginal product. Consequently, the willingness-to-pay values were adjusted in an effort to make the recreation values more compatible with values used for other resource outputs.
- The travel cost method estimates values on a site-by-site basis. The method does not address the question of whether regionally or nationally a given quantity of RVDs will, in fact, be consumed if the price were changed.
- Travel cost studies are typically done at higher quality sites, do not take into account substitutes to individual sites, and do not accurately measure trip length; consequently, values from the studies may be on the high side when applied to average situations on a Region-wide basis.

In response to the first concerns, the values were adjusted based on the relationship between the proportion of recreation provided by the Forest Service and estimates of an average Nation-wide demand elasticity for outdoor recreation. Nationally, roughly a 5 percent increase in price will result in a 1 percent decrease in quantity demanded (Lewis, 1977). In 1982 the Forest Service provided 7.5 percent of all outdoor recreation. Consequently, there will be a 5 percent decrease in price for each percent of the 7.5 percent Forest Service market share or a total decrease of 37.5 percent for clearing the market. Therefore, the initial willingness-to-pay values were reduced 37.5 percent for use in comparing resource allocation choices.

In response to the quality factor, the concept of standard and less-than standard service as introduced, and the resulting impact on the value of the experience to the recreationist was estimated. If recreation facilities are not fully maintained, the quality of the experience will be lowered. Two different sets of values were developed to account for the standard and less-than-standard outputs. A special study showed that on the average, the less-than-standard RVDs are valued at about 53 percent of the value of standard RVDs.

The recreation values were also expressed in terms of recreation opportunity spectrum classes and the wildlife values varied by the type of use. The values used are given in Table B-6.

Table B-6 1985 RPA Recreation and Other Benefit Values (1982$)

Activity	Units	Value/Unit
Primitive	$/RVD	11.25
Semi-Primitive Non-Motorized	$/RVD	13.25
Semi-Primitive Motorized	$/RVD	12.13
Roaded Natural	$/RVD	9.38
Rural	$/RVD	8.47
Wilderness	$/RVD	17.50
Big Game	$/WFUD	30.00
Small Game	$/WFUD	19.00
Non-Consumptive	$/WFUD	25.00

Other Outputs Considered In Economic Efficiency Analysis

The calculation of PNV enables the comparison of alternatives with regards to their output levels for priced resources, and their efficiency in producing them. However, other factors also influence the decision making process. In some cases, the importance of other outputs, for which it is impossible to assign monetary values, can outweigh the advantages of producing higher levels of priced outputs.

Net Public Benefits (NPB) represent the overall value to the Nation of all outputs and positive effects (benefits) less all associated inputs and negative effects (costs), whether they can be negative effects (costs), whether they can be quantitatively valued or not (36 CFR 219.3). Present net value is used as an index of NPB. It is the goal of forest planning to maximize net public benefits while responding effectively to issues and concerns. Some of the most important nonmarket outputs used as indicators of response to Issues and Concerns include:

- Visual quality
- Diversity and quality of recreation opportunities
- Old-growth retention

- Suitable Habitat for threatened and endangered species
- Social and economic values
- Cultural resources

These are outputs and effects which are influenced to a degree by decisions regarding how to manage the Forest. They are the topic of one or more issues and concerns which were identified at the outset of the planning process. It is not possible to measure their importance in dollar terms which are comparable to market values. Their values must be determined by their opportunity costs.

The provision for many of the response indicators is achieved by applying constraints to the production of priced outputs; i.e., timber harvesting constraints in FORPLAN. These constraints usually result in a decrease in the PNV of the priced outputs to which the constraints were applied. Judgments are then necessary in assessing whether benefits of producing the other outputs exceed the opportunity costs associated with producing fewer priced outputs.

Several of the response indicators considered during the development and evaluation of alternatives are discussed below. While the quantitative dollar values of each cannot be determined, they can generally be evaluated by examining such quantitative indicators as acres of appropriate allocation, resource inventories, or timber production related activities and outputs.

Visual Quality

While the value of visual quality is not directly included in the PNV calculations, its value is indirectly represented through the consideration of recreation as a priced benefit. It is safe to assume that the provision of positive visual experiences has a direct relationship to the quantity and quality of recreation on the Forest.

The alternatives each vary in their emphasis to satisfy visual quality objectives. This can be measured in terms of the percentage of retention and partial retention visual quality objectives which are being met through the implementation of an alternative.

Diversity and Quality of Recreation Opportunities

The number of recreation visitor days and their associated priced values are included in the PNV calculations for each alternative. However, the assigned dollar values per RVD do not reflect the value of providing a diversity of recreation opportunities and settings. Some aspects of the Recreation Opportunity Spectrum are becoming more difficult to retain. For example, as remaining Roadless Areas are either designated as Wilderness, or roaded and developed for other uses, there are fewer opportunities for the semi-primitive and primitive recreation experience outside of Wildernesses. Related to this is the idea that as more and more Roadless Areas are either developed or designated as Wilderness, future generations will have fewer options regarding how to best manage them to meet changing needs. To the extent that retaining Roadless Areas in undeveloped conditions does not overly restrict the efficient production of priced outputs, both the recreation diversity and the future options which they offer are considered a benefit. For each alternative, the recreation allocations and projected carrying capacities are categorized according to the Recreation Opportunity Spectrum. This will be used to assess the recreation diversity which an alternative provides.

Old Growth Retention

Maintaining plant and animal ecosystem diversity over time is also considered as a non-priced component of net public benefits. Benefits generally associated with old growth are gene pool maintenance for plant and wildlife species, scientific research opportunities, and the social values. The amount of old growth provided is especially important since this component would be difficult to replace. The amount of old growth retained serves as one way for evaluating each alternative's impact on ecosystem diversity. The effects of timber harvesting were examined for each alternative. To the extent an alternative provides for the preservation of old growth as a component of forested plant communities, the higher the benefits associated with this output.

Suitable Habitat for Management Indicator Species

The wildlife species on the Forest include the northern spotted owl, mountain goat, deer and elk, pileated woodpecker, pine marten, cavity excavators, and resident anadromous fish. Each alternative provide for at least enough habitat to satisfy the Management Requirements (MRs) for each of these species. However, some alternatives provide habitat for these species in excess of the MRs. Provision of suitable habitat in excess of the MRs is considered to be responsive to issues and concerns.

Social and Economic Values

Different levels of timber production and recreational opportunities on the Forest would bring about social and economic effects within the local area. While not con-

sidered in the PNV calculations, the stability of jobs and income in the local area stimulated by alternative levels of Forest timber and recreation outputs was analyzed. The implementation of an alternative that would cause change in jobs and income was considered to cause relative changes in local lifestyles and values.

Cultural Resources

Cultural resources are nonrenewable and once destroyed they cannot be replaced. Numerous laws and regulations require that cultural resource sites be located, inventoried, evaluated for significance, protected, and managed. To implement those requirements, Forest-wide standards and guidelines and Forest Service Manual policies apply regardless of the land management alternative selected. In every alternative, decisions about the management of each site will be made on an individual basis. All sites evaluated as significant, and thus eligible for the National Register of Historic Places, will be managed in all land allocations and in all alternatives. The type of management (avoidance and protection, or mitigation of project effects) will depend on the attributes of the site and the costs of the options.

Social And Economic Impact Analysis

Overview

Introduction

Different levels of timber production and recreational (including wildlife) opportunities on the Forest would bring about social and economic effects, especially within the primary influence area (Clackamas, Hood River, Multnomah, Wasco, Washington and Yamhill Counties).

Economic effects analyzed included changes in direct, indirect, and induced employment and in total income. Payments to counties in lieu of taxes would also vary. These economic effects are accompanied by social effects in local communities. Social effects included changes in local lifestyles and values, and in community identity (cohesion). The framework of the economic and social analysis was developed under the guidance of the Regional Sociologist, the Regional Economist, and FSH 1909.17, "Economic and Social Analysis."

There are other socioeconomic effects that can be identified by alternative, including employment effects related to commercial harvest of anadromous fish, employment and community effects related to future Forest budget levels, and secondary employments and community effects stimulated by changes in Forest payments to counties. These effects are either minor, difficult to predict or they can be tied to other effects. Anadromous fish spawned in Forest streams will continue to make relatively minor (less than 1 percent) contributions to total direct employment in commercial fishing. Forest Service employees and their families often constitute a significant portion of small rural communities surrounding the Forest. Future reductions in Forest budgets may induce substantial socioeconomic effects on these small communities, but future levels and distribution of actual funding levels are difficult to predict. Payments to counties induce secondary effects in rural areas by impacting employment tied to county road maintenance and schools. The direct changes in future levels of county payments are identified by alternative.

Overall, population change in the primary influence area, is also expected to be minor in response to the alternatives. The largest change in employment of any alternative potentially affects about 40 percent of the total employment. The positive and negative employment effects would tend to be only reflected in the unemployment rate in the near future There may be some dislocation of individuals as alternatives shift between recreation and timber opportunities, resulting in minor amount of in-migration and out-migration.

Forest Influence Area

Forest planning decisions on the Mt. Hood affect economic and social conditions in areas surrounding the Forest. In general, effects of Forest management will continue to be strongest in the immediate area, called the zone of primary influence, which includes most of Clackamas, Multnomah, Hood River, Wasco, Washington, and Yamhill Counties. The Forest secondarily influences the remainder of these counties, Clark County (WA), and portions of Linn, Marion, and Jefferson Counties. The distinction between the primary and secondary influence areas was defined based on:

- Review of public comments on past plans and the ICOs to determine what the public conceptualizes as the local area.
- Determining the area where the majority of Forest outputs flow.
- Determining areas with identifiable political boundaries for which data is available.

Economic and Social Analysis

Economic Impact Analysis

Introduction

Input-Output analysis was used to help evaluate the employment and income impacts associated with the proposed output and activity levels for each of the land management planning alternatives.

The impacts were primarily estimated for the first decade based on the timber, recreation, and wildlife outputs for each alternative. The quantitative employment and personal income impacts were qualitatively augmented with an assessment of the social consequences which could accompany the implementation of each alternative.

The IMPLAN model (Alward, et al. 1980) was used to perform the economic impact analysis. IMPLAN Version 2.0 is a program which runs on an MS-DOS microcomputer.

Economic Input-Output (I-O) analysis is a procedure for describing the structure of inter-industry dependencies in a regional economy. I-O analysis is based upon the interdependence of the production and consumption sectors of the economy for the area being studied. Industries must purchase inputs from other industries, as well as from primary sources (i.e. natural resources), for use in the production of outputs which are sold either to other industries or to final consumers. A set of I-O accounts can be thought of as a "picture" of an impact area's economic structure at one point in time. For the analysis conducted for the Mt. Hood, the most recent available data was from calendar year 1982.

The proposed output levels associated with each alternative are represented as changed in the current levels of final demand for the outputs in the IMPLAN model. The resulting production requirements needed to satisfy the changes in final demand and the flow of industrial inputs and outputs can then be traced via the I-O accounts to determine the impacts on the different industries composing the regional economy. Through mathematical matrix manipulations, the estimated direct, indirect, and induced impacts can be evaluated. The impacts concerning most people in the local economy are changes in employment and personal income.

Also of interest are the changes in the amount of payments to counties in lieu of taxes resulting from the implementation of an alternative. The IMPLAN I-O model was not used to analyze changes in county payments. The process used will be discussed after the following brief review of the data and information used to construct and calibrate the Mt. Hood I-O model.

IMPLAN Data Base

IMPLAN Version 2.0 is based on a 528 sector national model. This model derives its interindustry relationships from the 1977 Department of Commerce I-O model, but is updated to 1982. An individual county's model is derived from the national model by examining county data to determine which sectors of the national model are present in that county. The county model is then created as a subset of the national model. This process requires the assumption that the county interindustry linkages resemble the national picture. This assumption is reasonable for the Mt. Hood influence area economy.

The county level information is based on a 1982 data set constructed by Engineering Economic Associates of Berkeley, California. Utilizing the national technology matrix and the control totals for Multnomah, Hood River, and Clackamas Counties, a data reduction method was employed to develop the Input-Output table for the economic impact area. The method used exploits the property of "openness" displayed by smaller regional economies when compared to the national economy (Richardson, 1972). Smaller regional economies exhibit much greater tendencies to import and export goods and services than the national economy. Therefore, they are more "open" than the national economy. Assuming trade balances are the principal difference between national and regional purchase patterns (i.e., industry production functions are identical but regional imports and exports make local inter-industry transactions different), the supply-demand pool technique for data reduction was adopted (Schaffer, et al. 1969).

Comparisons indicated the Mt. Hood IMPLAN model did a reasonably good job of reflecting the "picture" of the county economy as it was in 1982. However, the local economy has changed since then. While the changes tend to make the employment and income predictions based on the 1982 I-O model of the counties less reliable, they are not meaningless in the presence of some knowledge of how the recent changes would affect the predictions if they were made with a more current model of the economy.

There have been significant changes in the structure of the wood product industry brought about by advances in sawmill technology since 1982. These technological advancements have reduced the labor intensity of lumber production. The IMPLAN model has not been revised to account for these changes. These changes were con-

sidered in the discussion of socioeconomic impacts in FEIS Chapter IV.

Final Demand Expenditures

For each alternative, the I-O model was used to translate proposed changes in timber, wildlife, and recreation resource output levels from recent average levels of production into changes in employment and personal income for the four-county area as a whole.

An intermediate step in the process was to equate the changes in the respective resource outputs into changes in final demand expenditures by sector. Final demand expenditures are different from the values used in the PNV efficiency analysis. The PNV efficiency analysis examines only the market value of the raw material leaving the Forest. For timber outputs, the market values are the stumpage values. On the other hand, final demand expenditures represent the dollars spent by the ultimate consumer at the point of final consumption. The point of final consumption is the sector from which the ultimate consumer purchases a product or the sector beyond which the output is exported from the region. For example, the point of final consumption for an output of timber might be in the new construction sector because the timber is used in the construction of a house which a consumer may purchase. However, if the timber is exported following processing at the sawmill, the point of final consumption is the sawmills sector. By identifying the final consumption point, the transactions of all industries involved in processing the output are considered. For more detail regarding how the final demand expenditures are calculated, refer to the IMPLAN, Version 1.1": Analysis Guide (Palmer, et al. 1985).

For purposes of assessing the potential economic impacts which may result from the implementation of an alternative, output levels for timber, wildlife, and recreation were tracked. The outputs were selected because they reflect the primary differences in the resource production levels between the alternatives, and they also have the most significance to the local economy.

Returns to the Local Government and U.S. Treasury

Predicted returns to the U.S. Treasury and local governments were calculated for each alternative. The return illustrates the potential impacts of Forest management decisions on both the federal government receipts collected as a result of revenue producing programs on the Forest and the resultant change in revenues passed on to the local governments.

Returns to the U.S. Treasury were calculated by deriving the revenue of income producing programs on the Forest. Virtually all cash returns to the U.S. Treasury from the Mt. Hood are generated by timber. Returns to local governments are calculated as 25 percent of the returns to the U.S. Treasury funds. The funds are paid to the State of Oregon and eventually passed on to the local county governments based on the percentage of the Forest acres located within each county. The returns to the local counties are often referred to as payments in lieu of property taxes, since the U.S. Government, as a landowner, does not pay local property taxes.

The projections of the revenues for each alternative were based on their respective proposed output and activity levels. The stumpage receipts, which account for over 98 percent of the total returns to the government, are based on the FORPLAN harvest scheduling solutions for each alternative.

Social Impact Analysis

Introduction

Once the economic impacts in terms of jobs, personal income, and the returns to the government were completed, the anticipated social impacts that would result from implementation of each alternative were assessed. Social impact analysis is the process of assessing how Forest Service management decisions affect human social life. Social impacts revolve around attitudes, beliefs, and values among various Forest user groups, and their expectations of the availability or permitted uses of National Forest resources. As described earlier, economic effects stem particularly from alternative levels of timber, wildlife, and recreation resources, which in turn affect lifestyles and values, and community cohesion in the local area, especially in terms of perceived changes in Forest-related work and leisure opportunities. Alternatives with rapid and large first decade changes from current timber, wildlife, and recreation levels would create more important and larger effects. The residents of rural areas would receive the most noticeable effects of any major changes.

Performing Social Analysis

The identification of social impacts by alternative were qualitative rather than quantitative. For each alternative, statements were developed regarding how some management practices and output levels would affect lifestyles and values, community cohesion. This analysis particularly considered changes in quantitative outputs, resulting in perceived shifts in Forest-related work and

leisure opportunities, and the social impacts on the three communities within the primary influence area.

Findings From The Social And Economic Analysis

Social Impacts

With regard to social impacts, different groups will be affected differently depending on the nature of the alternative being considered. Commodity-oriented alternatives tend to do well in maintaining the economic aspects of the social structure in the area. Increased supplies of timber, in particular, provide the raw material for the local wood processing industry to respond to regional and national markets, which in turn means more, relatively higher paying jobs. Communities which are more dependent upon the wood products industry than others will benefit from higher volumes offered. In addition, more timber means more revenues to the counties.

Other types of Forest Service decisions can influence the social well-being of Forest-dependent communities. The groups of communities which view or use the Forest from an amenity standpoint are positively impacted by amenity-oriented alternatives and negatively affected by alternatives with a commodity emphasis. Decisions regarding whether or not to develop Roadless Areas for timber harvesting, and how much timber should be harvested at the expense of scenic quality, wildlife, and other noncommodity types of resources will tend to polarize groups with different values and pull together groups with common values. Different issues may change the compostion of the groups.

The implications apply to communities as well as to groups within the communities. While most social groups can be found to some extent in each community, different groups may dominate in certain communities.

Almost all groups and communities can adapt to slow changes in their environment. However, rapid and dramatic changes in the way the Forest is managed are likely to bring about broad levels of social disruption.

A more detailed discussion of the effects of each alternative upon the social components of the environment can be found in Chapter IV of the FEIS

Economic Impacts

The modeling of economic impacts was based on the proposed changes in resource output levels between the respective alternatives and the output levels upon which the current economy is based. The output levels in three resource areas were used to determine the impacts on employment and income within the six-county area. Response coefficients were derived using the IMPLAN model which estimated the change in the employment and income per unit change in output of the resources. Table B-7 displays the response coefficients used for the resource areas.

Table B-7 Employment and Income Response Coefficients by Resource

	Output Units	Employment Response Jobs	Income Response MM
Timber	MMBF	12.42	.3357
Recreation	RVDs	1.29	.0268

Chapters II and IV of the FEIS present the details of the anticipated socioeconomic-economic impacts associated with the implementation of each alternative. In particular, Chapter IV displays the estimated impacts associated with each alternative for the first decade with regard to jobs, personal income, total returns to the U.S. Treasury, and the payments to counties in lieu of taxes. To avoid redundancy, the economic impacts estimated for each alternative will not be discussed here.

Analysis Prior to the Development of Alternatives

Introduction

Planning Step Six, the Analysis of the Management Situation (AMS), was performed prior to the development of alternatives. This planning step determined the ability of the Forest to supply goods and services and projected resource demands. The analysis determined the decision space which identified the Forest's capability to address the issues, concerns, and opportunities.

Benchmark analysis is an integral part of the AMS. Benchmarks are developed to meet National and Regional planning direction, to address ICOs, and to test the sensitivity of important planning assumptions and data. Additionally, the benchmarks help to define the

maximum economic and resource production possibilities, and evaluate the relationships between market and non-market goods and services.

A series of required and optional benchmarks were developed and analyzed in accordance with Regional Planning Direction (November 10, 1983). The FORPLAN model was used to estimate the schedule of management activities, resource outputs, and economic effects that were appropriate in achieving the objectives of the benchmarks. The GIS and planning database were used to develop the spatial information regarding resource inventories for the FORPLAN model. Other analytical tools were used to more completely identify the outputs and effects of the benchmarks. Throughout the development and analysis of benchmarks, professional judgment was required and a great deal of validation and calibration was performed. In many instances benchmarks were completely redone in order to achieve the objectives more accurately.

The following sections discuss the development of the management requirements, the purpose and objective of each benchmark, and the analysis of the benchmarks.

Management Requirements

Management Requirements (MRs) provide for short and long-term protection of viable resource levels. The requirements stem from the National Forest Management Act regulations (36 CFR 219.27). The following topics are addressed in the basic direction for management requirements:

- Resource Protection
- Vegetative Manipulation
- Silvicultural Practices
- Even-Aged Management
- Riparian Areas
- Soil and Water
- Diversity

Further direction for incorporating the requirements has been provided to the Forest in the form of "Regional Guidelines for Incorporating Management Requirements in Forest Planning" (FSM 1920, 2/9/83). The guidelines establish a Regional interpretation of the requirements. Management Requirements described in the Regional Guidelines deal with:

- Requirements that are outside the Forest Service's authority to change
- Requirements which impose substantive standards (as opposed to procedural)
- Requirements which are likely to have an impact on the analysis

The Forest interdisciplinary team assessed the 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. Management requirements that did impact other resources included timber dispersion, riparian management, soil and water protection, and maintaining viable population levels for pine martens, pileated woodpeckers, spotted owls, and cavity excavators.

Constraints were formulated to meet MRs such that complementary uses could be assigned the same acres. For example, pileated woodpecker and pine marten habitat were overlaid with spotted owl habitats to minimize the amount of land withdrawn from timber production.

Additional discussion on the description, background, and development of the MRs is provided in Appendix F.

Harvest Dispersion

The National Forest Management Act regulations state that no regeneration harvest unit (openings) may exceed 60 acres in the Cascade Douglas-fir region and 40 acres in other forest types. Logical harvest leave units also must be left between these openings. The leave units 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 between 10 and 20 years after final harvest. Implementation of the Regional Guidelines suggest a maximum of 25 percent may be in openings in any one decade and meet harvest dispersion.

This is slightly more constraining than the direction used in the DEIS analysis where it was determined that no more than 32 percent of a previously unentered area could be harvested in the first decade of entry. However, if 20 percent of the area was already harvested, the amount of new harvesting allowed dropped from 32 to 25 percent.

Harvest dispersion constraints were applied to each major drainage in the FORPLAN model. Each constraint restricts regeneration harvesting so that no more than 25 percent of the suitable land base may be in openings during any period. Since different timber species require varying amounts of time to reach 4.5 feet tall and some of acres currently under management are still classified as openings, the harvesting allowed in some

drainages is significantly less than 25 percent, especially in the first decade.

Riparian Areas

Riparian areas are unique forest ecosystems adjacent to streams, lakes, marshes, and other wet areas that provide habitat for a wide variety of wildlife species. These areas are also important in maintaining the aquatic environment. A number of management requirements deal with riparian areas and riparian dependent resources. Protection and special attention of riparian areas is required by 36 CFR 219.27(a) and 36 CFR 219.27(e). Protection of aquatic resources is stressed in 36 CFR 219.27(a) as is the conservation of soil and water resources. Providing, preserving and enhancing plant and animal community diversity is cited in 36 CFR 219.27(a) and 36 CFR 219.27(g). The use of two riparian management areas - General Riparian and Key Site Riparian were used to meet the above management requirements.

Generally, minimum riparian dependent resource requirements are met by management which emphasizes maintenance or improvement of terrestrial and aquatic habitat diversity. Conditions emphasized include: relatively diverse assemblages of plant communities; multiple canopy layers; frequent, small openings; ample ground and bank/shoreline; ground cover; complex aquatic habitats and a diverse, well distributed supply of standing and down, large woody material. The location, type, extent, duration and magnitude of management activities is intended to maintain these general conditions over the long term.

The general riparian prescription was applied to areas associated with perennial and fish-bearing streams, lakes and reservoirs, and wetlands. These riparian area types are closely linked in defining the quality and condition of aquatic resources and in providing primary diversity for riparian dependent plant and animal species. They include aquatic and riparian ecosystems and variable amounts of upland area which strongly influence their character and function. The actual location of general riparian areas will be determined as part of normal project planning and reconnaissance activities and will be based upon local site conditions, such as slope, soil condition, vegetative and aquatic habitat type.

The key site riparian prescription was applied to a select number of sites having: outstanding habitat diversity and complexity of riparian ecosystem types; relatively high natural quality; and notable capability for the production of multiple riparian resources. A strategic network of these areas was identified to provide a minimum geographic distribution and representation of most riparian area types - perennial and fish bearing streams, lakes and wetlands. Often the areas contained complexes of two or more of these types closely interacting with each other. Selected key site riparian areas have been identified on a location map (1:63360) and on 1:12,000 resource photos. Actual management area boundaries will be defined during project level field reconnaissance work planning using site-specific conditions including slope and vegetative character.

A variety of management options were considered to meet riparian resource management requirements. Development of separate management prescriptions for water, aquatic habitat, special wildlife habitats, sensitive plant species habitats and generalized wildlife/plant community diversity was explored. Preliminary analysis indicated this approach would result in a greater number of acres allocated than necessary. This led to the examination of techniques which would integrate requirements for all riparian dependent resources in one or more generalized management strategies. This "ecosystem" approach appeared to be an efficient alternative. An obvious application was to select a base set of riparian area types and geographic distribution and to minimize activities likely to adversely effect their general character and function. Applying no chargeable harvest to these areas was considered. It was attractive because it minimized "manageable" disturbance levels and avoided the need to fully understand or establish threshold of change levels for these diverse and relatively poorly understood areas. Additionally this approach would merely entail on-the-ground identification of areas and would avoid costly evaluation, prescription and logging system development associated with timber management activities.

After careful discussion and review, however, another approach was selected. It avoided chargeable timber harvest only in areas of highest value and sensitivity to riparian dependent resources. Those areas, key site riparian, were closely evaluated and strategically positioned across the Forest.

Of the remaining riparian area acres, those most closely controlling riparian resource MRs were identified. This group included perennial and fish bearing streams, lakes/reservoirs, and wetlands. Utilizing an interdisciplinary process involving specialists in soils, hydrology, botany, wildlife, fisheries and silviculture, a set of "minimum" conditions was described for each riparian area type. Using these desired conditions as a base, the team identified a restricted form of timber management as consistent. For remaining riparian area types, intermittent streams and seeps/springs, a separate set of conditions ensuring long-term integrity of ground cover, slope

and stream channel stability, and water quality was defined. These conditions allowed for full levels of timber harvest with mitigation measures. These include but are not limited to: area specific delineation and evaluation during planning; special falling, yarding and suspension requirements; leaving of dead and downed trees, culls and whips; and special fuel management and site preparation techniques.

This tiered approach which emphasizes ecosystem management for all riparian dependent resources appears to be most efficient and appropriate to meet the wide range of conditions found on this Forest.

In the draft EIS, this direction was modeled as follows:

Key site riparian areas have no chargeable timber harvest. Timber management activities will occur to the extent necessary to accomplish riparian management objectives on individual areas. Management activities will favor natural ecosystem processes.

General riparian areas will manage timber at less than full intensity, generally on longer rotations. Physical and biological attributes of these areas commonly reflect conditions most frequently associated with mature and old-growth timber stand types. The FORPLAN model had 50,000 acres of general riparian with rotation ages of 250 years.

For the final EIS, this direction was reviewed and the following changes were made to the model:

Modeling of key site riparian areas remained the same.

General riparian areas will manage timber at less than full intensity, but not always on longer rotations. This was a recognition that harvesting in the riparian areas would occur at the same time as the adjacent upland stands. This means rotation ages and the timing of other management activities would be determined by the underlying allocations. It was also recognized that, even with management activities similar to adjacent stands, the yields from the riparian acres would be lower due to other riparian requirements. To adjust for these timber volume differences in the FORPLAN model, 80 percent of the riparian area on the Forest was placed in a no harvest prescription. This 80 percent includes areas in key site riparian. The remaining 20 percent represents 3.4 percent of the Forest acreage. With the harvest of this acreage tied to the underlying allocations and with assumptions which remove only part of the timber volume from any harvested riparian acre, between 1 and 2 percent of the riparian timber volume would be removed each decade. How many acres are treated will depend on implementation of this management direction and will vary from location to location.

Watershed Impact

In the Draft EIS it was assumed that the management requirements for riparian areas and the harvest dispersion requirements would protect fish habitat and water quality sufficiently. Based on comments received and a Forest review, it was determined that additional protection was needed that would address this concern directly. Further examination of the management requirements for fish habitat and water quality identified the need to address the cumulative impact of management activities on these resources.

The watershed impact constraints directly address this concern by limiting the amount of disturbance to each major drainage. The model is constrained to require that 65 percent of each drainage be in a recovered condition at all times. This controls the cumulative effects of harvesting in order to prevent excessive damage to the drainage and to provide habitat for riparian dependent wildlife and fish.

Spotted Owls

The northern spotted owl is generally found within habitats containing mature and old-growth conditions at low elevations in the Douglas-fir region. The management requirements for the spotted owls were defined by Regional direction.

For the draft EIS, the Forest was directed to provide 1000 acres of habitat for 51 pairs of spotted owls. Between draft and final EIS, this direction changed and resulted in the need for more habitat areas with a greater number of acres in each. The final EIS manages for 66 habitat areas each composed of 1500 acres.

Two methods of modeling the spotted owl MR in FORPLAN, dedicated and managed, were considered. The dedicated approach managed each 1500 acre habitat area as old growth with no harvest activities. The managed approach added additional acres of suitable or capable spotted owl habitat to the original habitat area. Harvest activities in this larger managed area were constrained to ensure a minimum of 1500 suitable habitat acres. This model used long rotations to produce a managed condition with 1500 acres of continuous stands greater than 170 years. Based on a simple analysis of the two approaches and results from analysis performed by other National Forests, it was determined that the dedicated strategy is not only the more economically efficient but is also much simpler to implement on the ground.

For additional information on spotted owl management requirements, see Appendix F - Management Requirements.

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.

For the draft EIS, 600 acre habitat areas for 105 pileated woodpecker pairs and 320 acre habitat for 231 female marten were allocated for management on a 250 year rotation.

Like the spotted owl, two methods of modeling these MRs in FORPLAN, dedicated and managed, were considered. The analysis showed no significant differences in timber volume outputs or PNV. The interdisciplinary team adopted the dedicated approach for the final EIS due to its ease of modeling and implementation. To meet the management requirements, 300 acre habitat areas for 96 pileated woodpecker pairs and 160 acres habitat areas for 231 female marten were assigned to no harvest prescriptions.

Marten and pileated woodpecker habitats were located within Wilderness areas and other withdrawn areas wherever Regional distribution requirements were met. Habitat areas for these species were also located within the Spotted Owl Habitat Areas. Additionally, marten habitat acres were located within pileated woodpecker areas. Locating and combining habitats in this manner reduced the impacts on other resource management activities.

The management requirements, other than size, of marten and pileated woodpecker habitats were combined due to their similarity in the FORPLAN model.

Cavity Excavators

Between 50 and 70 species of birds on this Forest depend on habitat that contains standing dead trees (snags). The management requirement, defined by the interdisciplinary team, is to maintain 40 percent of the maximum potential habitat for these species forestwide. To provide a distribution of habitat across the Forest, it was determined that all prescriptions which allow timber harvest should support at least 60 percent of the potential habitat.

In the draft EIS, the effect on timber sales was estimated to be less than one percent. As a result, no reduction to FORPLAN yield tables was made.

Based on comments received, the interdisciplinary team re-evaluated the assumptions used. It was determined that the effect is much greater than originally thought. To account for snag mortality, 7 to 10 green trees per acre will be left standing after harvest. These trees range in size from 11.5" dbh to 18" dbh. The interdisciplinary team evaluated existing stands and the timber yield simulation runs for future stands to determine when the stands would naturally produce suitable habitat for cavity excavators. The effect of providing this habitat was modeled through reductions in timber yield tables.

Formulation of Benchmarks

Benchmarks were formulated and analyzed in order to help define the production potential and economic relationships of the market and non-market resources on the Forest. The benchmarks were developed and analyzed in accordance with the Regional Planning Direction (November 10, 1983). Benchmark runs which were specifically described in the Regional Direction package will be referred to by their respective run numbers to facilitate any discussion and comparison between Forests in the Region.

Between draft and final EIS, Runs 1, 3, and 7 were rerun to reflect changes in timber inventory and management requirements which occurred after the draft was issued. Because they had fulfilled their purpose in the alternative development process, the remaining benchmarks were not rerun. We believe the conclusions of the other runs would not change substantively as a result of the updates between the draft and final.

Benchmarks that are required include:

Minimum level: This benchmark specifies the minimum level of management which would be needed to maintain the Mt. Hood National Forest as part of the National Forest System. The benchmark was not based on FORPLAN analysis, and is described in the Analysis of the Management Situation.

Maximum present net value including assigned values: This benchmark is formulated to maximize the present net value of those outputs having either an established market price or assigned monetary value.

Maximum present net value based on established market price: This benchmark is formulated to maximize the present net value of those outputs that have an established market price. This benchmark was not based on FORPLAN analysis. The effect of ignoring assigned values is discussed later in this section.

Current level: This benchmark specifies the management most likely to be implemented in the future if current direction is followed. This benchmark forms the basis for the "no action" alternative.

Maximum resource levels: Each of these benchmarks estimates the maximum capabilities of the Forest to provide for single resource values. The major issues and concerns on the Mt. Hood National Forest resulted in the following maximum resource benchmarks:

- Timber
- Visual Quality
- Fish and Water
- Wildlife
- Roadless Recreation

Other benchmarks: Additional benchmark analysis is conducted to determine the effect of various assumptions and constraints which will be held constant when alternatives are developed. These include the effects of minimum management requirements, restricting timber harvest rotations to the culmination of mean annual increment (CMAI), and nondeclining flow (NDF) of timber harvest. These are covered in the following section describing the results of the benchmark analysis.

If a benchmark appeared to offer an opportunity to respond to issues, concerns, and opportunities, further analysis was conducted to examine it as a potential alternative. Thus some benchmarks are the basis for alternatives. Others display too many environmental, fiscal, legal and practical problems in the analysis and have been eliminated from detailed study. Use of benchmarks in developing alternatives is described later in this appendix.

Table B-8 displays objective functions and the major constraints of each benchmark used to analyze selected assumptions or constraints. Using different combinations of these benchmarks, it is possible to perform a with and without analysis and to identify the effects of the assumptions or constraints. Narrative comparisons of the benchmarks which analyze these effects follows in the section discussing the results of the benchmark analysis.

Because the purpose of departures is to accelerate timber harvest, all benchmarks and alternatives that do not

Table B-8 Benchmark Formulations

Benchmark	Objective Function	Constraints			
		95% CMAI	NDF	Mgt Requirements	Other
BM 1	Maximum Timber	X	X		
BM 2	Maximum Timber				
BM 3	Maximum PNV	X	X		
BM 3a	Maximum PNV	X	X	Dispersion	
BM 3b	Maximum PNV	X	X	Spotted Owls, Key Site Riparian	
BM 3c	Maximum PNV	X	X	Woodpecker, Marten, General Riparian	
BM 3d	Maximum PNV	X	X	None	No Price Trend
BM 4	Maximum Timber			All	
BM 5	Maximum Timber	X		All	
BM 5a	Maximum Timber	X		All	Floor
BM 5b	Maximum Timber	X			Floor
BM 5c	Maximum Timber	X			
BM 5d	Maximum PNV	X			Floor
BM 6	Maximum PNV		X	All	
BM 7	Maximum PNV	X	X	All	

include nondeclining flow as a constraint have maximum timber as their objective function. In each case, the FORPLAN run has been rolled over with a subsequent maximum PNV objective to ensure that timber has been maximized in the most economically efficient manner. In the benchmarks, timber has been maximized for the first decade and PNV has been maximized for 15 decades.

Demand and Monetary Value

Economic assumptions incorporated into the model have been described in Appendix B - Economic Efficiency Analysis. They have not been varied in any FORPLAN runs described here, except for the examination of price trends and costs. FORPLAN benchmarks do not include assigned values for non-market resources. The contribution of such resource outputs to PNV has been evaluated separately and is described in a discussion of the effect of assigned values on the analysis.

Constraints Common to all Benchmarks

All benchmarks described include the following constraints.

Timber harvesting activities are permitted only on those lands that were identified as tentatively suitable for timber production. This analysis is documented in Appendix B Inventory Data and Information Collection. No analysis of possible opportunities for timber management on unsuitable lands has been undertaken, nor have attempts been made to quantify salvage or other non-chargeable volume in any of the benchmark analysis presented here.

Two constraints that control what the model does at the end of the planning horizon have been applied in all FORPLAN runs. These include an ending inventory constraint and a constraint that prevents harvest in the final period from exceeding the long-run sustained yield capacity. These provide for enough standing timber volume after 150 years so that harvest at the long-term sustained yield capacity can be maintained. The effects of these constraints have not been evaluated.

A number of ways to constrain timber harvest flow have been investigated. Where departures from nondeclining yield have been evaluated, increases or decreases in timber volume offered between decades of the plan have been limited to 25 percent for the purpose of maintaining some level of local community stability.

Results of Benchmark Analysis

This section summarizes the important results of the benchmark analysis in relation to resource production relationships, the opportunity costs of various constraints, the use of market and non-market values, and the decision space for formulating alternatives. The effects on resource outputs and economic efficiency are addressed for:

- Timber price and cost assumptions
- Rotations restricted to 95 percent of CMAI
- Nondeclining flow constraint and harvest floors
- Management requirements
- Market versus nonmarket values

The key indicators for summarizing the benchmarks include PNV, acres treated, LTSY, and first decade Allowable Sell Quantity (ASQ). Additional indicators are used, when necessary, to assess other important differences.

Changes Between Draft and Final

The changes in inventory and management intensities between the draft and final are illustrated in the comparisons made for Benchmarks 1 and 3. Table B-9 compares the draft and final benchmarks in terms of the ASQ, LTSYC, and acres assigned to timber prescriptions. The cumulative impacts from the changes in the inventory and additional management intensities resulted in a less than 1 percent change in LTSYC.

Benchmark 7 is also compared between draft and final to portray the impact of the changes in the modeling of management requirements. The total impact, including the inventory and management intensity changes, is a decrease of 14 percent in LTSYC and ASQ measured in cubic feet. This decrease is primarily due to the FEIS increased habitat needs for spotted owls and changes to correctly model other management requirements. However, ASQ measured in board feet increased 4 percent due to inventory changes that are reflected in the board foot/cubic foot ratio.

Table B-9 Comparison of Draft and Final Benchmark Analysis

	Run 1		Run 3		Run 7	
	DEIS	FEIS	DEIS	FEIS	DEIS	FEIS
ASQ (MMBF/Year)	348	383	335	421	287	299
LTSYC (MMCF/Year)	69	69	66	69	57	49
Acres (M)	647	678	647	678	608	500

The remainder of the benchmark results described in this section are based on analysis performed for the AMS or DEIS. The data and assumptions used, including inventory data and management requirements, were those currently available at that time.

Effects of Price and Cost Assumptions

Regional direction requires a 1 percent per annum price trend for timber stumpage for the next 50 years. Further direction requires sensitivity analysis be conducted on the price trend assumption. There are arguments supporting price trends that are either larger or smaller than this rate. Costs and prices are based upon historical data, and future costs and prices are uncertain. If future timber values are different than those assumed by the model, or if management costs are higher or lower than estimated, the most economically efficient allocation of land or federal funds may not occur.

FORPLAN analysis can readily shed some light on discussions of the effects of assuming particular timber price trends. Sensitivity to changes in the costs could also be estimated, however it is more complicated than simply changing a trend parameter. Given the apparent insensitivity of the model to timber price changes described below, no further analysis of costs has been undertaken. Inferences have been drawn regarding costs from the analysis of prices.

Underestimating Price/Overestimating Cost

Examination of two benchmarks with the 1 percent trend may be used to assess the risks associated with this trend being too low. Effects of lower costs would be generally similar.

The only difference between benchmarks 1 and 3 is the objective function. PNV is maximized in benchmark 3 and timber volume in benchmark 1. Maximizing timber volume should produce the greatest possible allocation and investment to timber management, regardless of economic considerations. The difference between the level of timber harvest achieved in this case and that associated with the PNV objective represents potential effect of underestimating value or overestimating costs. Table B-10 shows this comparison.

Table B-10 Price Trends

	1% Price Trend		0% Price Trend
	BM 1 Max Timber	BM 3 Max PNV	BM 3d Max PNV
Acres managed for timber (M)	647	647	647
First decade MMBF/Year	348	348	329
LTSYC (MMCF/Year)	69	66	65
Timber Management Area managed at maximum intensity	99%	72%	57%
Average annual acres, 1st 50 years			
planting	5,912	5,023	3,836
precommercial thinning	5,920	4,698	3,788
fertilization	4,630	2,732	2,084
commercial thinning	3,638	718	194

The potential increase in first decade and long term timber volume is 3.8 percent. The changes appear more significant when measured in terms of actual management practices. There are more intensive management practices (and consequently higher costs), especially in the first decade. These are necessary to achieve the higher level of timber volume. Some amount of relative increase in timber value would render this intensive management economically efficient. The small opportunity to increase timber volume indicates that the model is not sensitive to increases in relative timber value.

Overestimating Price/Underestimating Cost

The third set of information in the Table B-11 is based on an assumption of no real increase in timber value over time. Increases in costs of producing timber volume would have a similar effect. The effects are very similar to changes from timber to economic objectives: management practices for timber in the first few

Table B-11 Rotation Constraints

Working Group	Site	95% of CMAI (Age)		Utilization Standards (Age)	
		High Intensity	Low Intensity	High Intensity	Low Intensity
Douglas-fir	High	70	100	40	50
True fir	High	90	120	40	70
Associated species	High	80	100	40	60
Pine/Oak	Low	150	150	50	50
Other species	Low	110	160	60	10

decades are reduced and consequently timber volume is slightly lower (1.8 percent). Again, the conclusion is that the model is not very sensitive to downward changes in the value of timber.

Rotations Constrained to 95 Percent of CMAI

By law, rotation ages for stands under timber management must reach biological maturity. The Forest Service interpretation of the legal requirement allows regeneration harvests at the age when a stand reaches 95 percent of the Culmination of the Mean Annual Increment (CMAI).

The age at which a stand reaches 95 percent of CMAI is dependent on timber working group and site, and timber management intensity. This information is summarized in Table B-11 along with the age of merchantability, when the stand meets utilization standards.

The opportunities foregone as a result of these constraints were analyzed in the presence of nondeclining flow and management requirements in Benchmarks 6 and 7. Both benchmarks were based on the same model formulation with one exception; Benchmark 6 was allowed to choose from both economic and biological rotations with the earliest rotation lowered to the age when the stand first reaches merchantable size.

The effect of the CMAI rotation constraints was also analyzed under a departure formulation with MRs between benchmarks 4 and 5. Benchmark 4 included rotations based on utilization standards. The effects of rotations at 95 percent of CMAI are presented in Table B-12. The difference in long-term sustained yield capacity is the same as the difference in first decade volume under nondeclining flow.

The increase in first decade harvest volume obtainable by relaxing the 95 percent CMAI policy constraint is minimal. Under nondeclining flow, first decade harvest volume is limited by long-term sustained yield capacity rather than the existing merchantable inventory. In this case, the shorter rotations are of no appreciable benefit. Shorter rotations have two opposing effects on long-term sustained yield capacity. A stand may be entered and volume removed more frequently, but the volume will be less at each entry than if postponed until culmination. There appears to be no net change.

Table B-12 Comparison of CMAI and Utilization Standards

Policy	Rotation based on:	Run	1st Decade Harvest (MMBF/Year)	LTSYC (MMCF/Year)	PNV (MM$)
Non-declining Flow	95% CMAI	BM 7	287	57	1,042
	Utilization Standards	BM 6	288	57	1,049
Departure	95% CMAI	BM 5	427	84	1,146
	Utilization Standards	BM 4	439	87	1,212

In a departure, the major limiting factor may be the constraint applied to harvest flow between decades (25 percent in this case - and there is no harvest floor) or other specific management constraints such as the MRs (primarily dispersion of harvest units). Other analyses have indicated that dispersion is a major determinant of departure capabilities. This will be discussed later in the examination of management requirements. This would indicate that the only opportunity to increase first decade volume in this situation is by making additional areas available for harvest in the first decade. Relaxing CMAI requirements has done this for existing stands between roughly 70 and 100 years old, yielding a 3 percent volume increase.

For Douglas-fir high sites which are harvested twice in the planning period, the rotation length averages one decade shorter under both kinds of harvest flow constraints when 95 percent of CMAI is not a constraint. There are also more acres managed under the most intensive management. The combination of shorter rotation lengths and higher investment levels is more economically efficient than lower management intensity and deferred benefits.

Nondeclining Flow Constraint and Harvest Floors

Current policy requires that the ASQ of the Forest must not decline over time and that the amount of volume offered for sale in any year cannot exceed the long-term sustained-yield level.

FORPLAN was used to compare the effects of two different departure formulations (Benchmarks 5 and 5a) and a run with nondeclining flow (Benchmark 7). The constraints common to all benchmarks have been included, as well as those needed to meet MRs. All of these runs were constrained to harvests at or beyond 95 percent of CMAI. The effects on timber harvest volume and PNV are shown in Table B-13.

Table B-13 Effects of Departure and Harvest Floor

	Base Harvest Schedule (BM 7)	Departure with Floor (BM 5a)	Departure with No Floor (BM 5)
Timber volume (MMCF/Year)			
1st Decade	57	84	84
2nd Decade	57	67	72
5th Decade	57	57	56
Minimum	57	57	26
150 Year Average	57	59	51
Timber PNV (MM$)	1,042	1,090	1,146

To determine the potential output of the Forest without this policy, a comparison was made between benchmarks 4 and 6. Both benchmarks contain constraints for MRs and allow stands to be harvested at utilization standards. Benchmark 4, however, replaced the nondeclining flow constraint with sequential bounds which allow the ASQ to change by 25 percent in consecutive decades.

The effects of nondeclining flow are also analyzed in benchmarks 5 and 7. These formulations require that rotations be based on 95 percent of CMAI in addition to MRs. Benchmark 5 replaces the nondeclining flow constraint with sequential bounds of 25 percent. Table B-12 in the previous section displays the effects of these four runs.

Volume in the early decades can be increased significantly on the Mt. Hood by allowing a 25 percent departure between decades. The nondeclining flow constraint is a limiting factor on harvest volume. Under nondeclining flow, it is necessary to defer harvest of eligible stands in order to maintain levels of harvest in the future. This reflects the fact that timber on the Forest is primarily mature or over-mature. Thirty-eight percent of this land supports stands of timber that are 200 years old or greater, and on 60 percent of the acres timber is 100 years old or greater.

A harvest floor equal to long-term sustained yield capacity does not limit first decade volume, but it does limit how long high levels may be obtained. They are maintained above long-term sustained yield capacity only at the expense of much lower harvests in later decades. The harvest floor does lead to higher total

Table B-14 Effect of Harvest Floor Constraint

Policy		Run	1st Decade Harvest (MMBF/Year)	LTSYC (MMCF/Year)	PNV (MM$)
No harvest floor	No MRs	BM 5c	765	151	1,628
	MRs	BM 5	427	84	1,146
Harvest floor	No MRs	BM 5b	531	105	1,428
	MRs	BM 5a	427	84	1,090

volume produced from the Forest. It does so at the expense of economic efficiency. Benefits are decreased because the volume is harvested later than where there is no harvest floor. Costs are increased because higher investments, particularly in planting, are needed to maintain high volumes in the middle decades.

The harvest floor constraint becomes non-binding in the first decade when MR constraints have been applied, as Table B-14 demonstrates. Since all alternatives and most benchmarks include MR constraints, a harvest floor of long-term sustained yield capacity has been included in all decades where a departure from nondeclining flow has been allowed. This constraint provides a stable long-term timber future supply. It also has the effect of ensuring that the long-term sustained yield capacity of any departure at least equals that of the base sale schedule. This prevents the sacrifice of long-term productivity for short-term production.

Constraints Providing for Management Requirements

The constraints which provide for MRs were described earlier in this section of Appendix B. Their effects are described here. The following figures compare the benchmarks used to analyze the effects of MRs. Note that spotted owl and key site riparian areas are combined as they both require unregulated harvest. Likewise, pine marten, pileated woodpecker, and general riparian were combined since they require mature sawtimber which can be maintained under a regulated timber management regime with a reduced harvest level. The effects of each group of constraints on management are displayed in Table B-15.

It is important to keep in mind that there is overlap of habitats for the wildlife species that cannot be accurately accounted for separately. Aggregate effect of all constraints cannot be determined by adding their separate effects. The aggregate effect is shown by comparing benchmark 3, which does not constrain to meet MRs, to benchmark 7, which applies all constraints as a package. All benchmarks included in this discussion have also been constrained to rotations determined by CMAI and by nondeclining flow.

Table B-15 Outputs from MR Constraint Analysis

	Benchmarks				
	3	3a	3b	3c	7
Area Managed (M Acres)					
For Timber	647	647	608	543	516
For Wildlife & Timber	0	0	0	94	92
Total	647	647	608	647	608
Timber Volume					
1st Decade (MMBF/Year)	335	332	313	318	287
LTSYC (MMCF/Year)	66	65	62	62	57
Timber PNV (MM$)	1,291	1,229	1,193	1,204	1,042

Dispersion

Based on information provided by benchmark 3a, it appears that dispersion constraints alone have little impact on the management of the Forest. In situations like this, where there are few other constraints, it is possible to substitute areas of comparable volume when dispersion limits are exceeded on the areas of first choice. Timber volume is reduced 1 percent. Analysis later in this section shows that the effect is greater under a departure from nondeclining flow.

Value of the timber is affected more than volume (a 5 percent reduction in PNV) as unit costs increase when more expensive sites must be harvested earlier. This

results in an increase in agency expenditures, even though sale volume is less. It also causes a shift to less intensive timber management regimes on about 10 percent of the sites. This shows up particularly as a change from planting to natural regeneration methods in the first decade when less valuable sites are harvested. The magnitude of the rescheduling of areas for harvest over time is indicated by a shifting of about 150 MMBF/year from Douglas-fir high sites on slopes less than 30 percent to areas with lower volume and/or higher costs.

Old growth is actually eliminated faster because more area is needed to yield the same volume. Roadless areas are more likely to be harvested in the first decade because of constraints on the development of other areas.

Spotted Owl Habitat Areas and Key Site Riparian Areas

In benchmark 3b, 39,000 acres suitable for timber management have been allocated to non-timber management. Roughly 85 percent of this is required for spotted owls, and 15 percent for riparian areas. The 6-8 percent reductions in PNV and timber volume are comparable to the reduction in area available for harvest.

Pine Marten, Pileated Woodpecker and General Riparian Habitats

The same number of acres is available for timber harvest in benchmark 3c as in benchmark 3. Of these, 94,000 are managed jointly for timber and wildlife. Habitat for the two wildlife indicator species comprises about 55 percent of this while the remaining 45 percent is attributable to riparian areas.

The effects on timber yield are represented in FORPLAN by two constraints. Initial rate of harvest is limited to 4 percent or less per decade, and rotation length for these management areas is assumed to be 250 years. In comparison to benchmark 3b, there are more total acres available for harvest, but increases in timber volume are offset by reductions in the volume per acre on lands under MR management. The net effects of benchmark 3c are virtually the same as benchmark 3b.

The constraints for pine marten, pileated woodpeckers and general riparian areas affect timber volume by lowering long-term sustained yield capacity. This reflects the predominance of mostly old, slow-growing trees that will be maintained on these areas. These constraints also affect PNV by deferring the harvest of some of the more valuable timber on the Forest.

Combined Effects of the MR Constraints

The main reason for the overall 14.5 percent reduction in timber volume is the provision of old growth or mature timber habitats which will maintain viable dependent wildlife populations. To the extent that these requirements will be met in separate areas, the effects will be largely additive. The effects of dispersion are apparent in changes in the locations of timber harvest. The stands greater than 200 years old that are available on lands managed for timber have increased 74 percent by the tenth decade. Mature timber (100-200 year old) has increased 10 percent (see Table B-16).

Table B-16 Condition of Tentatively Suitable Acres After 100 Years
(In thousands of acres)

Age of Stands	BM3	BM7
100 to 200 years old	104	116
Greater than 200 years old	22	86

The preceding discussion assumes that management is constrained only by constraints common to all benchmarks plus one or more management requirements. If there are other factors that result in reduced timber harvest, the reduction attributable to MRs will be less. This is generally the case in the alternatives. Departures, however, represent a situation where a constraint has been relaxed.

Effects of MRs on Departure Capability

A comparison of benchmark 5a to 5b demonstrates that constraints providing for MRs have a more pronounced effect when the nondeclining flow constraint is relaxed. Constraints representing the timber harvest dispersion component of MRs are especially limiting on the ability to achieve high levels of timber harvest in the first few decades. Both dispersion constraints and rate of harvest constraints for wildlife make much of the standing old growth timber effectively unavailable in the early decades. This comparison can be made in Table B-17.

Nonmarket (Assigned) Values

The calculation of PNV for each alternative includes discounted costs and benefits for timber, recreation, roads, wildlife, and "other" resources. Of these resource areas, only timber was modeled in FORPLAN. As a result, the effect of adding nonmarket values for recreation and other resources did not affect the FORPLAN solution. It follows that adding constraints (such as restricting rota-

Table B-17 Interaction of Harvest Flow and Management Requirements

Policy		Run	1st Decade Harvest (MMBF/Year)	LTSYC (MMCF/Year)	PNV (MM$)
Non-declining Flow	No MRs	BM 3	335	66	1,291
	MRs	BM 7	287	57	1,042
Departure	No MRs	BM 5b	531	105	1,428
	MRs	BM 5a	427	84	1,090

tions, nondeclining flow, etc.) to the FORPLAN model has no effect on non-market quantities and values. Therefore, decisions related to non-market values do not affect the models determination of market quantities, regardless of which harvest constraints are applied.

Resource Analysis

This section displays the results of analysis that was used to evaluate the opportunity to respond to major issues and concerns. Six benchmark runs have been included. Table B-18 summarizes the outputs and effects of these benchmarks. The "Public Issue Groups" and "Response Indicators" are described in Chapter I of the FEIS.

Constraints applied to the following resource benchmarks include, unless otherwise specified, the following common benchmark constraints:

- Timber harvest on tentatively suitable timber lands only
- Ending inventory constraint
- Long-term sustained yield link
- Rotations constrained to equal or exceed 95 percent of CMAI
- All management requirements
- Nondeclining harvest flow

Additional benchmark analysis was conducted during the Analysis of Management Situation and for the DEIS. A description of the analysis performed and the results can be found in the AMS and DEIS documents.

Formulation of Alternatives

Introduction

Requirements for Development of Alternatives

A Forest Plan alternative is a mix of management direction applied to specific areas on the Forest in order to achieve desired management goals and objectives. The interdisciplinary team formulated a broad range of alternatives according to NEPA procedures. The primary goal in formulating alternatives, besides complying with NEPA procedures, is to provide an adequate basis for identifying the alternative which comes nearest to maximizing net public benefits while addressing issues and concerns, and consistent with the resource integration and management requirements for CFR 219.13 through 219.27. Alternatives were developed according to the following NFMA 36 CFR 219.12(f) criteria:

- Alternatives shall be distributed between the minimum resource potential and the maximum resource potential to reflect to the extent practicable the full range of major commodity and environmental resource uses and values which could be produced from the Forest. Alternatives shall represent a range of resource outputs and expenditure levels.
- Alternatives shall be formulated to facilitate analysis of opportunity costs and of resource use and environmental tradeoffs among alternatives and between benchmarks and alternatives.
- Alternatives shall be formulated to facilitate evaluation of the effects on present net value, benefits, and costs of achieving various outputs

Table B-18 Summary of Benchmark Outputs and Effects

Public Issue Group / Response Indicators	Benchmark Theme					
	Max PNV (Assigned Values)	**Max Timber**	**Max Wildlife**	**Max Visual Quality**	**Max Fish & Wildlife**	**Max Unroaded Areas**
Issue 1: Timber						
ASQ, Green (MMBF/Decade)	2,870	3,040	1,140	2,070	1,300	2,460
TPSQ (MMBF/Decade)	3,630	3,830	1,470	2,650	2,030	3,110
LTSYC (MMCF/Decade)	565	599	288	437	281	485
Issue 2: Fish Habitat and Water Quality						
Aquatic Habitat Stability Index	2.7	2.7	N.E.*	N.E.	N.E.	N.E.
Acres Managed	82,800	166,300	166,300	166,300	284,800	166,300
Issue 3: Wildlife						
Acres of Old Growth after 50 years	225,300	180,000	404,000	288,000	346,000	261,000
Acres of Young Growth	112,300	87,600	86,100	69,500	43,200	76,400
Issue 4: Recreation						
Naturally Appearing Viewsheds	5	5	N.E.	22	N.E.	10
Slightly Altered Appearing	0	0	N.E.	24	N.E.	0
Issue 5: Unroaded Areas						
Areas Unroaded after 15 years	0	0	10	.5	10	10
Areas Unroaded after 50 years	0	0	0	3.5	0	10
Issue 6: Communities						
Payments to Counties	9	10	4	7	5	8
Change in Employment (Number of Jobs)	700	900	-3,300	1,200	2,300	-400
Economics						
Average Annual Costs During the First Decade ($MM/Year)	27	31	23	24	19	25
Timber PNV Components ($MM):						
Discounted Benefits	1,413	1,436	554	1,009	704	1,208
Discounted Costs	371	445	275	266	170	321
Timber PNV	1,042	991	279	744	534	887

* *N.E. - Not Estimated*

and outputs not assigned monetary values, but are provided at specified levels.

- Alternatives shall provide different ways to address and respond to the major Public Issues, Management Concerns, and Resource Opportunities (ICOs) identified during the planning process.
- At least one alternative shall be developed which responds to and incorporates the RPA Program tentative resource objectives for each Forest displayed in the Regional Guide.
- At least one alternative shall reflect the current program (direction) provided by the Forest and the most likely amount of goods and services expected to be provided in the future if current management direction continues. Pursuant to NEPA procedures, the alternative shall be deemed the "No Action" Alternative.
- Each alternative shall represent to the extent practicable the most cost-efficient combination of management prescriptions examined to meet the objectives established in the alternative.
- Each alternative shall state the conditions and uses resulting from the long-range application of the alternative, the goods and services to be produced, the timing and flow of the resource outputs together with associated costs and benefits, resource management standards and guidelines, and the purpose of the management direction proposed.

In addition to the RPA and No Action Alternatives in the above regulations, three other alternatives were identified by national or Regional direction:

- one which emphasizes high market opportunities
- one which emphasizes high non-market opportunities
- one which emphasizes undeveloped lands with intensified management of commodity outputs on the remainder of the Forest

A No Change Alternative was also added that displays the Forest's existing Unit Plans and the 1978 Timber Management Plan, adjusted to comply with the Unit Plans. However, this alternative does not comply with all the NFMA provisions could not be implemented without changes to the laws and regulations guiding the planning process.

Overview of Alternative Development Process

The formulation of alternatives (planning step five), was based upon the first four steps of the planning process:

- Identification of Issues, Concerns, and Opportunities (ICOs)
- Development of planning criteria
- Resource inventories and data collection
- Analysis of the Management Situation

Information gathered during the early steps was analyzed to guide the formulation of alternatives. The alternatives reflect a range of future resource management options for the Forest. Each major ICO was addressed in one or more of the alternatives. The need to satisfy legal and regulatory mandates was also a factor in the development of most alternatives. Finally, cost efficiency was a consideration throughout the process. The following discussion is a summary of the planning actions involved in the formulation and analysis of the alternatives. The focus will be upon the role which the ICOs and the benchmarks played in the alternative development process.

The alternatives were basically designed to address the different ways in which people prefer to use the Forest. Most of the preferences, along with the physical, biological, and legal limits of Forest management are reflected in the ICOs which were identified at the outset, and served to guide the overall Forest planning process (see Appendix A).

The Analysis of the Management Situation (AMS) was a key step leading up to the development and evaluation of alternatives. Projected demands or consumption levels were estimated for the Forest resources. In turn, the potential capability of the Forest to supply the resources was also analyzed.

Once the benchmark analyses were completed, the interdisciplinary team proceeded to formulate alternatives. The resource supply potentials and projected demands were compared to the identified planning ICOs and to the Current Direction Benchmark to identify opportunities and/or needs for change in order to best resolve the ICOs.

Members of the Interdisciplinary (ID) Team suggested various approaches to addressing each identified ICO. Those treated differently in individual alternatives and those treated similarly were both factors in creating the range of alternatives.

Tentative responses were initially pursued without considering cause and effect relationships with other issues

and concerns. The range of responses was then refined. Taken together with the Forest's decision space, these established the range of management alternatives.

The ID Team reviewed the ICO responses previously developed and selected those most compatible with the theme of each of the required alternatives. Responses were compared against the respective alternative themes. In some cases, one response was matched to more than one alternative.

After the ICO responses were evaluated against the required alternatives, those which were not assigned or were under-represented provided the basis for developing additional alternatives.

Refinement and fine tuning were continuous during this process. The persistent testing of each step and the interrelationships between steps was necessary to produce the needed range of alternatives.

When the ID Team decided that a satisfactory set of alternatives had been developed, the process was reviewed in detail by representatives of the Management Team.

Alternatives were then mapped. Portions of the Forest were assigned management direction in response to issues and concerns. An attempt had been made to state responses to issues and concerns in a manner which facilitated this step. For example, "assign strategies emphasizing semi-primitive recreation to all suitable portions of the Forest" or "assign the deer/elk winter range strategy to all inventoried winter range" were used. Each map is a picture which shows responses to ICOs proposed by a given alternative. Differences in the amount of land assigned to management strategies accounts for much of the difference between alternatives.

Each alternative was then analyzed using the FORPLAN model. Alternatives were modeled through the specification of an objective function and a set of constraints necessary to achieve the intent of a particular alternative. Outputs and conditions of the constraints must be achieved before the objective function can be maximized or minimized. Prescription assignments, combined with the necessary constraints, were analyzed in FORPLAN to identify an optimal solution which maximized PNV and achieved specific resource objectives in the most economically efficient manner. The constraints used are explained in the following sections. With varying objectives, each alternative produced a different combination of priced and non-priced outputs.

For all alternatives, a single FORPLAN run was insufficient to achieve the final formulation. In reviewing the FORPLAN reports and interpreting the results, the ID Team identified several changes needed to make the alternatives more realistic or implementable. In some instances, inconsistencies were uncovered in the compatibility of management strategies with the goals and objectives of certain alternatives. Many of the standards and guidelines of the original management strategies were refined to resolve the conflicts. For some situations, entirely new management strategies were developed.

After receiving and evaluating comments on the Draft EIS, a new alternative was formulated to respond to this additional input. This new alternative and all the other alternatives were also updated to reflect new information gathered after the Draft EIS was published.

Common Constraints

Many of the constraints used with the FORPLAN model to help formulate and characterize the different alternatives were the same across all alternatives, except for the No Change Alternative. The constraints were necessary in order to meet either Management Requirements, existing laws and policies, or to ensure technical implementability. Constraints were used which, while similar in all of the alternatives, varied in the amounts and locations to which they were applied. In addition, some constraints were totally unique to a particular alternative. In the following, the constraints which were applied in common to all alternatives will be presented in terms of their purpose and rationale. The constraints which were more or less unique between the alternatives will be discussed in the next section pertaining to the development of individual alternatives. Table B-19 displays the significant constraints in each alternative.

MR Constraints

The base model used in analyzing each individual management requirement was Benchmark Run 3. The opportunity costs and resource tradeoffs were discussed in the previous section.

Harvest Dispersion Constraint

Purpose: The dispersion constraint attempted to assure that regeneration cutting units did not exceed Regional standards in size while leaving logical cutting units for subsequent entries. It was used in alternatives to comply with the NFMA regulations.

Rationale: If the constraints were not used, the FORPLAN model could schedule harvests of large acreages that exceeded Regional standards in order to

Table B-19 Constraints by Alternative

Constraints	Alternative							
	NC	A	C	E	F	H	I	Q (Preferred)
Base Harvest Policy								
Non-declining Flow	X	X	X		X	X	X	X
Rotations @ 95% CMAI	X	X	X	X	X	X	X	X
Perpetual Harvest	X	X	X	X	X	X	X	X
Departure (25% Variation)				X				
Management Requirements								
Dispersion		X	X	X	X	X	X	X
Wildlife MRs		X	X	X	X	X	X	X
Riparian Areas		X	X	X	X	X	X	X
Watershed Impact		X	X	X	X	X	X	X
Other Constraints								
Visual Management		X	X	X	X	X	X	X
Earth Flows				X	X	X	X	X
Special Emphasis Watersheds				X	X	X	X	X
Winter Range					X	X	X	X
Summer Range					X	X	X	X
Pine/Oak Habitat				X	X	X	X	X
Forage Flow (+/- 10%)						X		
Modification VQO for Timber Emphasis						X		

best meet its objective function of maximizing present net value.

Tradeoff: The dispersion constraint restricts the schedule of timber harvest activities in the FORPLAN model which potentially reduces PNV and ASQ.

Perpetual Timber Harvest Constraint

Purpose: The constraint attempts to ensure the total inventory volume left at the conclusion of the harvest scheduling planning horizon is sufficient to maintain the harvest pattern established for the given alternative.

Rationale: In the absence of the constraint, the FORPLAN model would have no incentive to leave enough inventory at the end of the harvest scheduling horizon to sustain the harvest levels into perpetuity. It was used in all alternatives to comply with NFMA regulations.

Tradeoff: Since some volume which is available for harvest at the end of the harvest scheduling horizon must be reserved for future decades, timber-related outputs and benefits are potentially reduced.

Nondeclining Flow/Sustained Yield Constraint

Purpose: The constraint ensures that harvest amounts in each decade are equal to or greater than the previous decade harvest. The harvest in the last decade must be equal to or below the LTSY calculated for a particular alternative.

Rationale: The constraint meets Forest Service policy of nondeclining flow which provides a steady supply of

timber. It was applied to all alternatives except E and is in compliance with NFMA Regulations.

Tradeoff: The nondeclining flow constraints as opposed to permitting a departure harvest schedule restricts the model's flexibility to harvest timber in such a way as to maximize PNV. Therefore, early decade economic returns and timber output levels are traded off in exchange for stable long-term harvest levels.

Rotations Restricted to 95 Percent of CMAI Constraint

Purpose: This constraint required that no stand be regeneration harvested before meeting 95 percent of CMAI rather than scheduling harvest rotation based on economic criteria.

Rationale: This constraint was applied to all alternatives in order to meet NFMA regulations which state that timber stands must generally meet biological maturity before being regenerated.

Tradeoff: The 95 percent CMAI limitation on rotation age is based on biological criteria as opposed to economic criteria. During the Benchmark analysis, FORPLAN was used to evaluate the tradeoffs associated with the application of the constraint. In the absence of the constraint, the model attempts to harvest stands at a much earlier age using economics as the driving force. A higher PNV but lower first decade harvest would be realized if the constraint were not applied.

Riparian Area Constraint

Purpose: The riparian area constraint limits the amount of disturbance and controls the age class structure within riparian areas in order to provide habitat for dependent wildlife and fish. The constraints represent the MR for riparian areas and attempt to maintain the existing habitat conditions.

Rationale: In absence of the controls on vegetation manipulation within riparian areas, excessive disturbance would deteriorate wildlife and fish habitat conditions. The loss of shade would raise water temperatures and the removal of large streamside trees would eliminate replacements for in-stream woody debris.

Tradeoff: The harvest restrictions of the riparian area constraints slightly lower PNV and ASQ. This constraint only maintains the existing habitat for resident and anadromous fish so there were no increases in fish benefits to offset the reductions in PNV due to losses in timber benefits. A negative relationship on fish habitat below this MR level was not analyzed.

Watershed Impact Constraints

Purpose: The watershed impact constraints limit the amount of disturbance to each major drainage by requiring that 65 percent of the drainage be in a recovered condition at all times. This controls the cumulative effects of harvesting in order to prevent excessive damage to the drainage and to provide habitat for dependent wildlife and fish.

Rationale: In the absence of these controls, excessive disturbance would deteriorate wildlife and fish habitat conditions. The cumulative effect of harvesting activities must be considered since impacts at the per acre level will not reflect the true condition of the watershed resource.

Tradeoff: The harvest restrictions of the watershed impact constraints will slightly lower PNV and ASQ. This constraint only maintains the existing habitat for resident and anadromous fish so there were no increases in fish benefits to offset the reductions in PNV due to losses in timber benefits. A negative relationship on fish habitat below this MR level was not analyzed.

Wildlife MR Habitat Constraints

Purpose: These land allocations allowed for the MR levels of habitat for spotted owls, pine martens, and pileated woodpeckers. The minimum level of specific habitat requirements were provided for each of these species by prohibiting harvest in the allocated areas.

Rationale: These constraints were applied to all alternatives in order to meet NFMA regulations and the Region's MR requirements. Without these constraints minimum viable populations of these species would not be maintained.

Tradeoff: Significant reductions in PNV and ASQ are realized in applying the constraints. Analysis conducted during the AMS showed the effects of the constraints individually and in aggregate. Since the above species were not valued, there were no mitigating effects on PNV.

Other Constraints Common to all Alternatives

In addition to the constraints necessary to meet management requirements, several other constraints were used in all alternatives. These constraints were not analyzed individually since their opportunity costs would vary given the different allocations in each alternative.

Visual Management Constraints

Visual management strategies are composed of three special requirements:

- a minimum harvest rotation age
- a maximum rate of harvest
- a dispersion constraint that specified the maximum area allowed to be in openings at any time

These requirements vary depending on the visual management objectives and are summarized in Table B-20.

Table B-20 Visual Management Objectives

	Minimum Rotation Age	Maximum Rate Of Harvest	Maximum Area In Openings
Foreground and Middleground Retention	250 years	4 percent	8 percent
Foreground Partial Retention	200 years	5 percent	10 percent
Middleground Partial Retention	125 years	8 percent	16 percent

An opening was further defined to be closed when the trees reached an average height of 20 feet. Each of these requirements were examined to determine which was most restrictive or "binding". The dispersion constraint on openings was found to be most binding and was then formulated as a FORPLAN modeling constraint. The acres of openings were tracked as an output in FORPLAN and the constraint was applied to each visual prescription in each major drainage. This approach also allowed the model to account for the current openings which were the result of past activities.

Earth Flow and Special Emphasis Watershed Constraints

These constraints provide for the protection of earth flow areas that are at risk and sensitive watersheds. They are similar to the watershed impact constraints except they are applied to smaller, more specific, geographic areas. The constraints require a certain percentage of the area to be in a recovered condition at all times. An acre is considered to be recovered when the trees are 8 inches in diameter and have a 70 percent crown closure. Since this varies by species, it occurs at ages ranging from 35 to 80 years old. A FORPLAN output tracks the acres in a recovered condition and the constraint is placed on this output for the acres allocated to Earth Flows (B8) and Special Emphasis Watersheds (B6). The constraint levels vary depending on the mix of acres in different earth flow risk categories and the sensitivity of the allocated watersheds. They include 75 percent for moderate and 90 percent for high risk earth flows, and 75 or 82 percent for special emphasis watersheds.

Other Wildlife Habitat Constraints

In addition to the wildlife habitat constraints that are management requirements, constraints were developed for winter range, summer range, and pine/oak habitat. These constraints were based on habitat requirements directly tied to specific vegetative conditions. In both winter and summer range the goal was to produce a distribution of forage, hiding cover, thermal cover, and optimal cover. An evaluation of these requirements showed that the optimal cover conditions were the most difficult to achieve and, therefore, the modeling constraints should address this condition. It was determined that optimal cover could be achieved on the westside when the trees reached 110 years old and on the eastside, 150 years old. The winter range allocation called for a minimum of 25 percent of the area to be in optimal cover at any one time. The summer range allocation called for a minimum of 20 percent of the area to be in optimal cover at any one time on the westside and 15 percent on the eastside. The constraints were adjusted to account for existing conditions and the time necessary to achieve the desired goal levels.

Pine/oak habitat was achieved through the design of an uneven-aged timber management regime which took into account the desired vegetative condition. In cases where uneven-aged management was not possible a scenario similar to winter range was used in the FORPLAN modeling.

Development of Alternatives

Benchmarks defined the minimum and maximum output levels of Forest resources and the outputs associated with current management. The maximum PNV benchmark (Benchmark Run 7) identified the most efficient land allocation and schedule of activities and outputs, given the information quantified in FORPLAN. This provided a starting point for the formulation of each alternative. Land allocations and output levels were varied by alternative to better resolve mixes of issues, concerns, and opportunities. This resulted in a

decrease in present net value compared to the maximum PNV benchmark. The constraints associated with each alternative reflect the Forest Management Team's best estimate of the most cost effective method of achieving the goals and objectives of the alternative.

The following discussions focus on the development of each alternative. Numerous iterations occurred for some alternatives where prescriptions or schedules were adjusted to better accomplish goals and objectives. The final sets of constraints and objectives for each alternative follow. Complete descriptions of the alternatives are found in Chapter II of this FEIS along with detailed discussions of the opportunity costs and resource tradeoffs, for each alternative.

No Change Alternative

Purpose

Alternative NC is the No Change alternative and displays the Forest's existing Unit Plans and the 1978 Timber Management Plan, adjusted to comply with the Unit Plans. The No Change alternative does not comply with all provisions of the National Forest Management Act (NFMA). Consequently, it could not be implemented under the Forest Plan without Congressional and/or Secretary of Agriculture action to change the laws and regulations guiding the planning process.

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 1) the suitable land base, 2) the standing volume, and 3) 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.

Criteria and Assumptions

- The management direction in this alternative is that contained in the existing land management plans, rather than the standards and guidelines developed under NFMA and used in all of the other alternatives. Incorporate the existing Timber Management Plan, adjusted to 1984.
- Apply a timber harvest policy of nondeclining flow.
- Use current information regarding land suitability, yields, and utilization standards.
- Assure that at least 12 of the Forest's 44 most sensitive viewsheds do not appear more than slightly altered in 50 years.
- No provisions for management of suitable habitat for spotted owl, pileated woodpecker, pine marten, Merriam's turkey, silver-gray squirrel, deer, and elk.
- Aggressive application of the Timber Management Plan's Streamside Management Unit and Special Wildlife Habitat (wetlands) direction would minimize reductions in the riparian resource capability.
- Open the corridors along potential eligible Wild, Scenic and Recreational Rivers to management activities that could alter the values contributing to their eligibility.

Constraints

The constraints utilized to meet the objectives of this alternative include the following land allocations.

Alternative NC Allocation Categories	Acres
Timber Emphasis	443,730
Visual Emphasis	
Retention	47,471
Foreground Partial Retention	16,871
Middleground Partial Retention	59,546
Wildlife Emphasis	
Summer Range	0
Winter Range	0
Pine/Oak Habitat	0
Earth Flows and Special Emphasis Watershed	285
No Programmed Harvest	495,547
Total Forest	1,063,450

Purpose: Management strategies were allocated to portions of the Forest in order to meet the management direction provided in existing unit and functional plans.

Rationale: This allocation depicts the current management situation thus representing the No Change Alternative.

Tradeoff: When compared to benchmark 7, the removal of management requirements in this alternative

increase PNV by 3 percent, first decade ASQ and LTSY by 5 percent and suitable lands by 13 percent.

Analysis of Constraints within Alternative NC

	BM 7	Alt. NC
PNV (MM$)	1,184.7	1,227.6
1st Decade ASQ (MMCF/Year)	48.8	51.6
LTSYC (MMCF/Year)	48.8	51.6
Suitable Lands (M Acres)	500.7	567.9

Alternative A

Purpose

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. 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. Alternative A is the "No-Action" Alternative, which is required by the National Environmental Policy Act (NEPA) and the National Forest Management Act (NFMA).

Criteria and Assumptions

- Incorporate management direction from all existing unit and functional plans and maintain the existing land allocations.
- Incorporate those standards and guidelines necessary to meet Management Requirements (MRs).
- Apply a timber harvest policy of nondeclining flow.
- Use current information regarding land suitability, yields, and utilization standards.
- Assure that at least 12 of the Forest's 44 most sensitive viewsheds do not appear more than slightly altered in 50 years.
- No Forestwide standards and guidelines for management of deer and elk.
- Interim protection of the corridors along potential eligible Wild, Scenic and Recreational Rivers would continue until a suitability determination can be made.

Constraints

In addition to the common constraints applied to all alternatives, the additional constraints utilized to meet the objectives of this alternative include the following land allocations.

Alternative A Allocation Categories	Acres
Timber Emphasis	315,878
Visual Emphasis	
Retention	42,617
Foreground Partial Retention	13,847
Middleground Partial Retention	62,848
Wildlife Emphasis	
Summer Range	0
Winter Range	0
Pine/Oak Habitat	0
Earth Flows and Special Emphasis Watershed	0
No Programmed Harvest	628,260
Total Forest	1,063,450

Purpose: Management strategies were allocated to portions of the Forest in order to meet the management direction provided in existing unit and functional plans. This current direction is updated to meet management requirements.

Rationale: This allocation depicts the current management situation thus representing the "no-action" alternative.

Tradeoff: When compared to benchmark 7, the added land allocation constraints for this alternative reduce PNV by 23 percent, first decade ASQ and LTSY by 20 percent, and suitable lands by 13 percent.

Analysis of Constraints within Alternative A

	BM 7	Alt. A
PNV (MM$)	1,184.7	910.6
1st Decade ASQ (MMCF/Year)	48.8	38.9
LTSYC (MMCF/Year)	48.8	38.9
Suitable Lands (M Acres)	500.7	435.2

Alternative C

Purpose

This alternative was developed in response to the public issues concerning adequate timber supplies and community stability. Alternative C most closely approximates the RPA program for the Mt. Hood National Forest.

Criteria and Assumptions

- All land suitable for growing trees would be managed for intensive timber production, including the Bull Run Watershed. Timber harvesting would occur on a regularly scheduled basis in the watershed.
- Apply a timber harvest policy of nondeclining flow.
- Incorporate those standards and guidelines necessary to meet Management Requirements (MRs).
- Use current information regarding land suitability, yields, and utilization standards.
- Assure that at least 2 of the Forest's 44 most sensitive viewsheds do not appear more than slightly altered in 50 years.
- No Forestwide standards and guidelines for management of deer and elk.
- Interim protection of the corridors along potential eligible Wild, Scenic and Recreational Rivers would continue until a suitability determination can be made.

Constraints

In addition to the common constraints applied to all alternatives, the additional constraints utilized to meet the objectives of this alternative include the following land allocations.

Alternative C Allocation Categories	Acres
Timber Emphasis	431,104
Visual Emphasis	
Retention	7,685
Foreground Partial Retention	10,402
Middleground Partial Retention	36,456
Wildlife Emphasis	
Summer Range	0
Winter Range	0
Pine/Oak Habitat	0
Earth Flows and Special Emphasis Watershed	0
No Programmed Harvest	577,803
Total Forest	1,063,450

Purpose: Management strategies were allocated to portions of the Forest in order to produce the highest levels of timber outputs.

Rationale: The allocations for this alternative allow the highest levels of timber production consistent with MRs and other required constraints.

Tradeoff: When compared to benchmark 7, the added land allocation constraints for this alternative reduce PNV by 7 percent, first decade ASQ and LTSY by 5 percent, and suitable lands by 3 percent.

Analysis of Constraints with Alternative C

	BM 7	Alt. C
PNV (MM$)	1,184.7	1,106.8
1st Decade ASQ (MMCF/Year)	48.8	46.4
LTSYC (MMCF/Year)	48.8	46.4
Suitable Lands (M Acres)	500.7	485.7

Alternative E

Purpose

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 the assumption that the past determinations of management emphasis in previous plans are still generally valid and effective when adjusted for the most recent laws and scientific information. This alternative also reflects more recently identified needs to reduce timber harvest levels on some portions of the Forest in response to public issues of water

quality, fish and wildlife, and recreation. In response to the community stability public issue, the timber harvest schedule would be a departure which emphasizes production of volume above the long-term sustained yield quantity.

Criteria and Assumptions

- Produce as much timber as possible during the first decade.
- Do not reduce harvests more than 25 percent per decade and maintain harvests at or above long-term sustained yield every decade.
- Incorporate those standards and guidelines necessary to meet Management Requirements (MRs).
- Use current information regarding land suitability, yields, and utilization standards.
- Assure that at least 21 of the Forest's 44 most sensitive viewsheds do not appear more than slightly altered in 50 years.
- Incorporate standards and guidelines for management of deer, elk, turkey, and squirrel habitat. Provide for half of the turkey and squirrel range through a specific management allocation.
- Provide for modest, long-term increases in Forestwide riparian resource capabilities.
- Interim protection of the corridors along potential eligible Wild, Scenic and Recreational Rivers would continue until a suitability determination can be made.

Constraints

In addition to the common constraints applied to all alternatives, the additional constraints utilized to meet the objectives of this alternative include the following land allocations.

Alternative E Allocation Categories	Acres
Timber Emphasis	271,059
Visual Emphasis	
Retention	39,462
Foreground Partial Retention	13,799
Middleground Partial Retention	58,918
Wildlife Emphasis	
Summer Range	0
Winter Range	0
Pine/Oak Habitat	7,085
Earth Flows and Special Emphasis Watershed	37,051
No Programmed Harvest	636,076
Total Forest	1,063,450

Purpose: Management strategies were allocated to portions of the Forest in order to incorporate the land allocations and management emphases determined in previous plans.

Rationale: The allocations for this alternative assume past determinations of management emphases are still valid and adjusts those allocations to be consistent with MRs and other required constraints.

Tradeoffs: When compared to benchmark 7, the departure harvest schedule for this alternative increases first decade ASQ by 9 percent, while the added land allocation constraints reduce PNV by 18 percent, LTSY by 23 percent, and suitable lands by 15 percent.

Analysis of Constraints within Alternative E

	BM 7	Alt. E
PNV (MM$)	1,184.7	971.0
1st Decade ASQ (MMCF/Year)	48.8	53.4
LTSYC (MMCF/Year)	48.8	37.6
Suitable Lands (M Acres)	500.7	427.4

Alternative F

Purpose

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.

Criteria and Assumptions

- Produce as much timber as is economically feasible while still meeting visual requirements.
- Apply a timber harvest policy of nondeclining flow.
- Incorporate those standards and guidelines necessary to meet Management Requirements (MRs).
- Use current information regarding land suitability, yields, and utilization standards.
- Assure that at least 40 of the Forest's 44 most sensitive viewsheds do not appear more than slightly altered in 50 years.
- Incorporate standards and guidelines for management of deer, elk, turkey, and squirrel habitat. Provide for half of the turkey and squirrel range through a specific management allocation.
- Establish Bald Eagle habitat areas.
- Provide for significant, long-term increases in Forestwide riparian resource capabilities.
- Interim protection of the corridors along potential eligible Wild, Scenic and Recreational Rivers would continue until a suitability determination can be made.
- Recommend East Fork of the Hood River for designation under the Wild and Scenic Rivers Act.

Constraints

In addition to the common constraints applied to all alternatives, the additional constraints utilized to meet the objectives of this alternative include the following land allocations.

Alternative F Allocation Categories	Acres
Timber Emphasis	121,181
Visual Emphasis	
Retention	78,877
Foreground Partial Retention	25,558
Middleground Partial Retention	65,485
Wildlife Emphasis	
Summer Range	1,778
Winter Range	3,637
Pine/Oak Habitat	10,990
Earth Flows and Special Emphasis Watershed	25,829
No Programmed Harvest	730,115
Total Forest	1,063,450

Purpose: Management strategies were allocated to portions of the Forest in order to address the recreational emphasis of this alternative. Allocations, such as visual management, which are consistent with this objective were applied to many areas.

Rationale: The allocations for this alternative were selected to respond to the recreation public issue.

Tradeoffs: When compared to benchmark 7, the added land allocation constraints for this alternative reduce PNV by 50 percent, first decade ASQ and LTSY by 47 percent, and suitable lands by 33 percent.

Analysis of Constraints within Alternative F

	BM 7	Alt. F
PNV (MM$)	1,184.7	596.4
1st Decade ASQ (MMCF/Year)	48.8	25.8
LTSYC (MMCF/Year)	48.8	25.8
Suitable Lands (M Acres)	500.7	333.3

Alternative Q

Purpose

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.

Criteria and Assumptions

- Derive land allocations from current plans, new legal requirements, public issues, and management concerns.
- In an economically efficient manner, produce as much timber as possible during the first decade subject to a nondeclining flow policy.
- Incorporate those standards and guidelines necessary to meet Management Requirements (MRs).
- Use current information regarding land suitability, yields, and utilization standards.
- Assure that at least 34 of the Forest's 44 most sensitive viewsheds do not appear more than slightly altered in 50 years.
- Incorporate Forestwide standards and guidelines for management of deer, elk, turkey, and squirrel habitat. Produce a stable and continual population of deer and elk through intensive management of some critical summer and winter range. Provide for half of the turkey and squirrel range through a specific management allocation.
- Establish Bald Eagle habitat areas.
- Provide for significant, long-term increases in Forestwide riparian resource capabilities by increasing land allocations to riparian and watershed protection. Allocate 112,000 acres in eighteen watersheds to special emphasis watershed and 17,400 acres to key site riparian management.
- Interim protection of the corridors along potential eligible Wild, Scenic and Recreational Rivers would continue until a suitability determination can be made.

Constraints

In addition to the common constraints applied to all alternatives, the additional constraints utilized to meet the objectives of this alternative include the following land allocations.

Alternative Q Allocation Categories	Acres
Timber Emphasis	162,307
Visual Emphasis	
Retention	58,925
Foreground Partial Retention	31,428
Middleground Partial Retention	57,633
Wildlife Emphasis	
Summer Range	4,134
Winter Range	7,723
Pine/Oak Habitat	5,745
Earth Flows and Special Emphasis Watershed	61,147
No Programmed Harvest	674,408
Total Forest	1,063,450

Purpose: Management strategies were allocated to portions of the Forest in order to respond to public comments focused on water quality, fish, wildlife, recreation, and visual management. Timber harvest was emphasized subject to meeting these other resource objectives.

Rationale: The allocations for this alternative represent the Forest Management Team's resolution of key issues and concerns.

Tradeoffs: When compared to benchmark 7, the added land allocation constraints for this alternative reduce PNV by 43 percent, first decade ASQ and LTSY by 35 percent, and suitable lands by 22 percent.

Analysis of Constraints within Alternative Q

	BM 7	Alt. Q
PNV (MM$)	1,184.7	676.3
1st Decade ASQ (MMCF/Year)	48.8	31.9
LTSYC (MMCF/Year)	48.8	31.9
Suitable Lands (M Acres)	500.7	389.0

Alternative H

Purpose

Alternative H would preserve 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.

Criteria and Assumptions

- Derive land allocations from current plans, new legal requirements, public issues, and management concerns.
- In an economically efficient manner, subject to a nondeclining flow policy and other resource objectives, produce as much timber as possible during the first decade.
- Incorporate those standards and guidelines necessary to meet Management Requirements (MRs).
- Use current information regarding land suitability, yields, and utilization standards.
- Assure that at least 42 of the Forest's 44 most sensitive viewsheds do not appear more than slightly altered in 50 years.
- Incorporate Forestwide standards and guidelines for management of deer, elk, turkey, and squirrel. Provide for half of the turkey and squirrel range through a specific management allocation.
- Establish Bald Eagle habitat areas.
- Provide for significant, long-term increases in Forestwide riparian resource capabilities by increasing land allocations to riparian and watershed protection. Allocate 112,000 acres in eighteen watersheds to special emphasis watershed and 17,400 acres to key site riparian management.
- Interim protection of the corridors along potential eligible Wild, Scenic and Recreational Rivers would continue until a suitability determination can be made.

Constraints

In addition to the common constraints applied to all alternatives, the additional constraints utilized to meet the objectives of this alternative include the following land allocations.

Alternative H Allocation Categories	Acres
Timber Emphasis	101,575
Visual Emphasis	
Retention	25,987
Foreground Partial Retention	14,098
Middleground Partial Retention	34,367
Wildlife Emphasis	
Summer Range	6,509
Winter Range	6,554
Pine/Oak Habitat	7,038
Earth Flows and Special Emphasis Watershed	23,544
No Programmed Harvest	843,778
Total Forest	1,063,450

Purpose: Management strategies were allocated to portions of the Forest in order to preserve the existing old growth stands. Other activities that are consistent with this objective are encouraged.

Rationale: The allocations for this alternative meet the requirements to protect the existing old growth timber stands.

Tradeoffs: When compared to benchmark 7, the added land allocation constraints for this alternative reduce PNV by 66 percent, first decade ASQ and LTSY by 63 percent, and suitable lands by 56 percent.

Analysis of Constraints within Alternative H

	BM 7	Alt. H
PNV (MM$)	1,184.7	405.5
1st Decade ASQ (MMCF/Year)	48.8	18.1
LTSYC (MMCF/Year)	48.8	18.1
Suitable Lands (M Acres)	500.7	219.7

Alternative I

Purpose

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 activities. The needs of animal species which require open areas would be met through 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.

Criteria and Assumptions

- Derive land allocations from current plans, new legal requirements, public issues, and management concerns.
- In an economically efficient manner, subject to a nondeclining flow policy and other resource objectives, produce as much timber as possible during the first decade.
- Incorporate those standards and guidelines necessary to meet Management Requirements (MRs).
- Use current information regarding land suitability, yields, and utilization standards.
- Assure that at least 27 of the Forest's 44 most sensitive viewsheds do not appear more than slightly altered in 50 years.
- Maintain 70 spotted owl management areas, each containing 1875 acres of suitable habitat.
- Incorporate Forestwide standards and guidelines for management of deer, elk, turkey, and squirrel habitat. Provide for a stable population of deer and elk through additional allocations. Provide for half of the turkey and squirrel range through a specific management allocation.
- Establish Bald Eagle habitat areas.
- Provide for substantial, long-term increases in Forestwide riparian resource capabilities by increasing land allocations to riparian and watershed protection. Allocate 112,000 acres in eighteen watersheds to special emphasis watershed and 17,400 acres to key site riparian management.
- Interim protection of the corridors along potential eligible Wild, Scenic and Recreational Rivers would continue until a suitability determination can be made.
- Recommend East Fork of the Hood River for designation under the Wild and Scenic Rivers Act.

Constraints

In addition to the common constraints applied to all alternatives, the additional constraints utilized to meet the objectives of this alternative include the following land allocations.

Alternative I Allocation Categories	Acres
Timber Emphasis	12,226
Visual Emphasis	
Retention	25,744
Foreground Partial Retention	13,547
Middleground Partial Retention	43,874
Wildlife Emphasis	
Summer Range	146,178
Winter Range	49,506
Pine/Oak Habitat	12,007
Earth Flows and Special Emphasis Watershed	30,201
No Programmed Harvest	730,167
Total Forest	1,063,450

Purpose: Management strategies were allocated to portions of the Forest in order to provide for fish and wildlife habitat needs. Other activities that are consistent with this objective are encouraged.

Rationale: The allocations for this alternative meet the requirements to emphasize fish and wildlife habitat needs.

Tradeoffs: When compared to benchmark 7, the added land allocation constraints for this alternative reduce PNV by 48 percent, first decade ASQ and LTSY by 44 percent, and suitable lands by 33 percent.

Analysis of Constraints within Alternative I

	BM 7	Alt. I
PNV (MM$)	1,184.7	613.7
1st Decade ASQ (MMCF/Year)	48.8	27.5
LTSYC (MMCF/Year)	48.8	27.5
Suitable Lands (M Acres)	500.7	333.3

Estimating Effects of Benchmarks, Discretionary Constraints and Alternatives

Introduction

This section provides a detailed discussion of the outputs and effects of the alternatives. The focus is upon the tradeoffs between the alternatives as they provide different levels and mixes of goods and services, and as they address the planning ICOs in different ways. The purpose of presenting a discussion on the outputs and effects of each alternative and the consequences of the constraints used to help formulate them, is to facilitate the identification of the alternative which comes closest to maximizing net public benefits while responding effectively to issues and concerns. In order to accomplish this objective there needs to be an understanding of the abilities of the Forest to produce different goods and services in response to public issues and the tradeoffs involved with the decisions to produce one mix of outputs as opposed to another. This comparative analysis provides a basis for selecting the Preferred Alternative, Step 8 of the planning process.

Process for Evaluating Significant Constraints

The multiple resource management objectives associated with a particular benchmark or alternative were represented in FORPLAN as a combination of constraints, and an objective function which was usually maximize present net value. This objective function required the selection of the most economically efficient combination of prescriptions, activity schedules, and resource output levels which satisfied the multiple resource management objectives of a particular benchmark or alternative.

The maximization of present net value was first subject to satisfying all of the constraints which were used to represent the other resource objectives. The imposition of the constraints normally reduced the PNV. The PNV given up in response to achieving the objectives of a constraint is referred to as the "opportunity cost" of that constraint. Changes in resource outputs are referred to as physical tradeoffs.

Opportunity costs and physical tradeoffs will be referred to as tradeoffs in further discussions. In order to isolate the tradeoffs associated with a particular constraint or set of constraints, additional analysis was conducted, separate from the alternative comparative analysis.

During the benchmark analysis, constraint sets which were needed in order to achieve the various multiple resource management objectives were developed and evaluated. For example, all of the different constraints developed to achieve the MRs were evaluated both individually, and collectively, to determine the magnitude of their tradeoffs.

Discretionary constraints (those not legally required) were also examined in order to assess the magnitude of their opportunity costs. These constraints were often used in conjunction with unique prescriptions to produce the desired multiple resource management objectives; e.g., visual quality, wildlife habitat, recreation settings, etc., of an alternative. The policy constraints associated with nondeclining flow and rotations based on CMAI were also evaluated in the context of their effects on PNV and timber output levels. Finally, sensitivity analyses were performed in order to provide information regarding consequences involved in making assumptions about price trends on future timber values.

The results of the analysis of the legal and policy constraints were discussed in Appendix B - Analysis Prior to Development of Alternatives and will not be repeated here. The analysis of the discretionary constraints was discussed in Appendix B - Formulation of Alternatives.

Analysis of Tradeoffs Among Alternatives

The trade-off discussion will be upon the alternatives response to public issues, production of resource outputs, and socioeconomic effects. The environmental consequences of the alternatives are presented in Chapter IV of the FEIS and will not be repeated here. The purpose is to highlight how each alternative maximizes net public benefits while responding differently to Issues and Concerns. A more complete understanding of the differences between alternatives requires reading Chapters II and IV of the FEIS, and Appendix A discusses the public issues in greater detail.

Present Net Value and Discounted Costs and Benefits of Alternatives

The proposed alternatives are ranked by decreasing PNV in Table B-21. The figure displays the PNV and the total discounted costs and benefits of each alternative. Changes in PNV and total discounted costs and

Table B-21 Present Net Value and Discounted Costs and Benefits of Alternatives Millions of Dollars Discounted at 4 Percent

Alternative	PNV	Change in PNV	Discounted Costs	Change in Discounted Costs	Discounted Benefits	Change in Discounted Benefits
NC	1,227.6		140.7		1,429.8	
C	1,106.8	-120.8	134.0	-6.7	1,299.1	-130.7
E	971.0	-135.8	119.4	-14.6	1,095.6	-203.5
A	910.6	-60.4	117.9	-1.5	1,116.1	20.5
Q (Preferred)	676.3	-234.3	110.5	-7.4	869.6	-246.5
I	613.7	-62.6	88.0	-22.5	821.0	-48.6
F	596.4	-17.3	99.9	11.9	806.5	-14.5
H	405.5	-190.9	89.0	-10.9	620.4	-186.1

benefits between the ranked alternatives are also shown. The change in PNV estimates the net economic value that would be foregone if a lower-ranked alternative is selected over the previous one.

In Table B-22, the costs and benefits are disaggregated into major resource groups to show the relative economic importance and variability of Forest resources.

The benefit groups include dollar values for timber and recreation. Recreation includes all types of dispersed, developed, and Wilderness recreation including wildlife and fish-dependent recreation, referred to as wildlife and fish user days (WFUDs).

Costs are grouped to show budget expenditures for timber, roads, recreation, wildlife, and "other" costs. Recreation costs include management costs associated with all wildlife and fish-dependent recreation. Wildlife includes only costs associated with habitat management.

The "other" cost group is all other Forest costs not attributed to the named groups. It includes resource costs that vary little by alternative or those that are minor in significance. Administrative overhead, fire protection, facility construction and maintenance, and nursery management are the major components in this cost group.

The pattern of decreasing PNV, benefits, and costs is primarily due to changes in timber production. Generally, timber benefits decline faster than timber and road costs, inducing declines in the PNV of the Forest. Timber benefits and costs vary the most across alternatives. Throughout the alternatives, changes in wildlife benefits are the result of wildlife investments. Otherwise, wildlife benefits are stable. Recreation benefits and costs are relatively similar for all alternatives.

The total discounted timber benefits change by $815.7 million across all alternatives. Recreation benefits change by $18.4 million. The variations in discounted costs for timber, roads, recreation, and wildlife are $29.7 million, $13.5 million, $4.1 million, and $4.3 million, respectively. In general, as PNV decreases across alternatives, so do benefits and costs.

Differences in Economic Benefits and Cash Flows

Comparison of economic benefits to budget costs provides another measure of the economic efficiency of an alternative. 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, special use permits, and seedling sales from the Nursery. Livestock grazing and campground use includes actual cash receipts and non-cash benefits.

Non-market resource values which are noncash benefits include dispersed recreation, Wilderness, and wildlife-dependent recreation. The purpose of assigning dollar values as non-cash benefits is to reflect a resource's total benefit to society even though none or only part of the total value is collected as cash receipts.

Net cash flows, cash receipts, and noncash benefits are displayed in Table B-23. Three alternatives show positive flows to the U.S. Treasury during the first decade.

Table B-22 Discounted Costs and Benefits of Alternatives by Major Resource Groups Millions of Dollars [1] Discounted at 4 Percent

Alternative	Discounted Benefits[2]		Discounted Costs				
	Timber	Recreation	Timber	Roads	Recreation	Wildlife	Other
NC	1,230.7	199.1	46.6	21.1	24.6	10.7	37.9
C	1,100.0	199.1	41.2	18.7	24.6	11.4	38.2
E	897.9	197.7	35.3	16.0	24.0	7.8	36.4
A	919.8	196.3	32.4	14.7	24.0	9.3	37.1
Q (Preferred)	674.9	194.7	31.0	14.1	22.2	7.1	36.0
I	622.4	198.6	16.9	7.6	20.5	7.1	36.0
F	619.5	187.0	24.3	11.0	21.6	7.1	36.0
H	415.0	205.4	17.2	7.7	21.1	7.1	36.0

[1] *Direct comparisons of benefits and costs by individual resource provide broad indications of specific relationships, but they may be misleading because many costs are nonseparable under multiple use management.*

[2] *Recreation benefits include benefits associated with managing WFUDs.*

Net receipts vary from a negative $16.3 million to a positive $11.4 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 while non-cash benefits increase. The cost decreases are due to less expenditures to rehabilitate recreational facilities and, in the cases of a harvest scheduling departure, less timber being sold. The increases in non-cash benefits are found in the increasing number of recreation visitors to the Forest.

Other cash receipts are predicted to remain relatively constant into the future. Costs decrease primarily because major new road and trail construction occurs only in the first three decades. The increase in timber values and the early investments in roads and timber production lead to major increases in net receipts in later decades.

Economic Values and Responses to Major Public Issues

The major reason why alternatives differ is that each was designed to respond to the issues in a different way. This section and Table B-24 summarize many of those differences by using quantifiable indicators of response to these issues.

One public issue, *"Diminishing supply, or availability, of resources traditionally used in Native American religious and cultural life"*, was addressed the same way for all alternatives. However, this issue is related to several other issues. The level of timber harvest will indirectly affect the amount of huckleberries available in some areas. The management of fish and wildlife habitat, especially that for salmon, will affect the amount of salmon and other species available to Native Americans.

How each alternative responds to issues and a more complete description of how the alternatives respond to all issues can be found in Chapters II and IV of the FEIS. Table B-24 shows how each alternative responds to the public issues described below.

Public Issue 1 - *Level of timber supply on the Mt. Hood National Forest.*

Indicators:

- First decade average annual Allowable Sale Quantity (ASQ) in millions of cubic feet (MMCF).
- Timber Sale Program Quantity (TSPQ) in million of cubic feet (MMCF).
- Long-Term Sustained Yield Capacity (LTSYC) in millions of cubic feet (MMCF).

Table B-23 Average Annual Cash Flows and Noncash Benefits (MM$)[1]

	Alternative							
	NC	C	E	A	Q (Preferred)	I	F	H
Decade 1								
Net Receipts	2.7	0.5	11.4	-3.1	-9.7	-4.8	-11.7	-16.3
Total Costs	58.3	55.4	49.4	48.6	45.7	36.5	41.4	36.9
Total Receipts	61.0	55.9	60.8	45.5	36.0	31.7	29.7	20.6
Noncash Benefits to Users	82.6	82.2	81.1	80.7	80.0	81.4	76.6	84.7
Decade 5								
Net Receipts	25.4	17.2	12.5	13.0	9.1	15.3	2.3	-7.6
Total Costs	58.3	55.4	49.4	48.6	45.7	36.5	41.4	36.9
Total Receipts	83.7	72.6	61.9	61.6	54.8	51.8	43.7	29.3
Noncash Benefits to Users	83.6	83.6	84.1	83.6	83.2	85.6	79.7	88.0

[1] *Cost include only those of the Forest Service; payments to counties have not been deducted from total receipts.*

Public Issue 2 - *Community stability.*

Indicators:

- Average annual payments to counties within the Influence Area.
- Change in jobs.

Public Issue 3 - *Maintenance and distribution of old growth.*

Indicator:

- Acres of old growth remaining by decade for 50 years.

Public Issue 4 - *Viable populations of Spotted Owls and management indicator species.*

Indicators:

- Population numbers or amount of suitable habitat protected for each Management Indicator Species (MIS).
- Habitat Capability Index for deer, elk and salmonids.

Public Issue 5 - *Conflicts between management activities and competing recreational activities.*

Indicator:

- Supply and demand of dispersed recreation experience (ROS classes) by decade expressed in RVDs (Recreation Visitor Days).

Public Issue 6 - *Maintenance and enhancement of scenic quality.*

Indicators:

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

Public Issue 7 - *Disposition of the remaining Roadless Areas.*

Indicators:

- The number and acreage 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.

Public Issue 9 - *Maintenance and rehabilitation of fish habitat and water quality.*

Indicators:

- Aquatic Habitat Suitability Index.
- Acres explicitly managed to meet riparian objectives.

Public Issue 10 - *The supply of developed recreation site opportunities.*

Indicators:

- Supply and demand of developed recreation experiences (ROS classes) by decade expressed in RVDs (Recreation Visitor Days).
- Supply and demand of developed recreation by decade expressed by PAOT (People At One Time) by decade.

Public Issue 11 - *Wild, Scenic, and Recreational Rivers.*

Indicators:

- 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.

Public Issue 12 - *Deer and elk management.*

Indicator:

- Habitat capability index by alternative.

Differences and Similarities of Individual Alternatives

In the comparisons below, the alternatives are arranged by decreasing Present Net Value (PNV). Since the goal of planning is to maximize net public benefits while responding to the issues, the following discussion identifies how each alternative's response to the issues reduces PNV. By comparing each alternative with the preceding one, the incremental tradeoffs between PNV and other outputs which indicate the response to public issues can be shown.

Alternative NC

This alternative has the highest present net value ($1,226.6 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 B-24 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 2,906 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 B-24 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 wold 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 B-24 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 2,561 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 B-24 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 1,452 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 B-24 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 B-24 shows specific levels of output for all these indicators by alternatives.

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 B-24 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 B-24 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.

Table B-24 Comparison of Issue and Concern Response

Issue/Outputs/Effects	Alternative							
	NC	A	C	E	F	H	I	Q (Preferred)
Timber Supply								
Average Annual, First Decade Allowable Sale Quantity (ASQ)	313	235	282	317	154	108	165	189
Timber Sale Program Quantity (TSPQ)	357	268	321	361	176	123	188	215
Long-Term Sustained Yield Capacity (LTSYC)MMCF	51.6	38.9	46.4	37.6	25.8	18.1	27.5	31.9
Old Growth								
Existing Old Growth	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	320.8
2nd Decade	261.1	281.8	272.4	284.8	303.3	318.5	301.7	299.7
5th Decade	185.6	225	205.5	223.9	262	290.1	271.5	254.6
Potential Old Growth Including In-Growth								
1st Decade	302.1	312.7	307.7	300.8	323.6	330.2	322.6	320.6
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 Explicitly Managed to 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								
1st Decade (Pileated Woodpecker)	267	272	269	267	278	280	277	275
2nd Decade(Pileated Woodpecker)	250	259	252	250	268	274	267	263
5th Decade (Pileated Woodpecker)	199	219	206	212	242	256	238	231
1st Decade (Spotted Owl)	166	171	167	167	173	175	173	173
2nd Decade (Spotted Owl)	157	160	157	155	167	173	167	164
5th Decade (Spotted Owl)	124	137	128	131	151	144	149	144

Table B-24 Comparison of Issue and Concern Response (continued)

Issue/Outputs/Effects	Alternative							
	NC	A	C	E	F	H	I	Q (Preferred)
1st Decade (Pine Marten)	588	598	591	588	609	615	608	604
2nd Decade (Pine Marten)	552	571	559	553	590	601	588	579
5th Decade (Pine Marten)	452	492	492	477	537	565	530	513
1st Decade (Turkey)	2,200	2,200	2,000	3,800	4,600	3,800	5,400	4,100
2nd Decade (Turkey)	3,800	3,300	3,000	4,900	5,800	5,500	6,500	5,600
5th Decade (Turkey)	4,000	3,200	2,900	4,850	5,900	5,400	6,400	5,500
1st Decade (Squirrel)	2,200	2,200	2,000	3,800	4,600	3,800	5,400	4,100
2nd Decade (Squirrel)	4,180	3,300	2,800	5,320	7,360	6,080	7,000	6,700
5th Decade (Squirrel)	5,060	3,200	2,700	5,300	7,500	6,000	6,900	6,500
1st Decade (Elk)	4,900	5,100	4,900	6,500	6,700	7,100	7,350	7,300
2nd Decade (Elk)	3,900	4,700	4,500	6,300	6,100	6,300	6,900	6,900
5th Decade (Elk)	4,100	4,900	4,700	6,300	6,500	6,900	7,900	7,300
1st Decade (Deer)	17,400	18,300	17,400	24,100	24,900	27,400	28,200	28,200
2nd Decade (Deer)	13,300	16,600	15,800	23,300	22,400	23,300	26,600	26,600
5th Decade (Deer)	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) Expressed in MRVDs								
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
Supply of Developed Recreation Site Opportunities								
Supply of Developed Recreation Experiences (ROS Classes) by Decade Expressed in MRVDs (Recreation Visitor Days)								
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

[1] *Includes Wilderness Use Capacity.*

Table B-24 Comparison of Issue and Concern Response (continued)

Issue/Outputs/Effects	Alternative							
	NC	A	C	E	F	H	I	Q (Preferred)
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								
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 Senic	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
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	5
2nd Decade	3	3	2	3	9	9	10	5
5th Decade	3	3	2	3	9	9	10	5
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	113,620	81,130

Table B-24 Comparison of Issue and Concern Response (continued)

Issue/Outputs/Effects	Alternative							
	NC	A	C	E	F	H	I	Q (Preferred)
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 Within the Influence Area (MM$ 1982)	12.0	8.9	11.0	11.8	5.8	4.0	6.1	6.8
Change in Total Jobs	2,906	1,452	1,977	2,561	461	106	-211	964
Economic Values								
Total Cash Flow, Average								
1st Decade (MM$)	2.7	-3.1	0.5	11.4	-11.7	-16.3	-4.8	-9.7
5th Decade (MM$)	25.4	13.0	17.2	12.5	2.3	-7.6	15.3	9.1
Present Net Values($Million)	1,227.6	910.6	1,106.8	971.0	596.4	405.5	613.7	676.3

Appendix C

Roadless Area

Appendix C
Roadless Areas

Appendix C -Roadless Areas

Introduction

The purpose of this Appendix is to present a detailed and site-specific analysis of the areas of the Mt. Hood National Forest that are in an unroaded and essentially undeveloped condition. It includes a description of the resources, physiographic and biologic features, and the present management situation for each area. In addition, it specifically indicates how each area would be affected by the alternatives proposed in this FEIS. Map III-21 (Chapter III of FEIS) shows the vicinity of all ten unroaded areas. Individual maps are included in this Appendix.

The first Roadless Area Review and Evaluation (RARE I, FEIS 10/73) identified eleven roadless areas on the Mt. Hood National Forest. Four of these areas were studied for wilderness through the unit planning process: Roaring River, Salmon-Huckleberry (in the Salmon River/Roaring River FEIS, 1/74), and Eagle, Larch (in the Eagle Creek Planning Unit FEIS, 1/75). Roaring River was allocated to special interest - scenic and portions of Salmon-Huckleberry were recommended for backcountry and landscape management. In the Eagle Creek Planning Unit FEIS, Larch was allocated to special interest - scenic and landscape management and portions of Eagle were recommended as a study area for wilderness suitability.

The 1979 roadless area inventory (RARE II) required reevaluation of roadless areas by less stringent criteria and eliminated the need to consider areas evaluated for wilderness in the unit Plans. On the Mt. Hood, eleven roadless areas were identified. The Larch and Roaring River roadless areas were not considered because of completed unit plans while the Mt. Jefferson (small portion on the Mt. Hood - bulk of the area on the Willamette National Forest) and Wind roadless areas were added. The Salmon-Huckleberry area was expanded beyond the area considered in the original Unit Plan and included in RARE II. The RARE II process recommended portions of Bull of the Woods, Eagle, and Salmon-Huckleberry for wilderness and proposed Olallie for further planning. The remainder of the areas were recommended for nonwilderness.

The Oregon Wilderness Act of 1984 designated portions of five of the eleven RARE II areas for wilderness: Badger, Bull of the Woods, Eagle, Mt. Jefferson, and Salmon-Huckleberry. The passage of the Act eliminated the need for the remaining roadless areas, with the exception of Olallie Further Planning Area, to be studied for wilderness during the first generation of Forest Plans. For areas remaining in an unroaded condition, wilderness options will be reviewed when this plan is revised. The full text of this portion of the Act is found in Section 7., parts (a), (b), and (d).

According to the Oregon Wilderness Act of 1984 (and, similarly, the California Wilderness Act of 1984): *"...with respect to the National Forest System lands...which were reviewed...in the second Roadless Area Review and Evaluation (RARE II,...(RARE II) shall be deemed for the purpose of the initial land management plans...to be an adequate consideration of the suitability of such lands for inclusion in the National Wilderness Preservation System and the Department of Agriculture shall not be required to review the wilderness option prior to the revision of the (Forest) plans, but shall review the wilderness options when the plans are revised which will ordinarily occur on a ten-year cycle...(Roadless areas) shall be managed for multiple use in accordance with land management plans pursuant to Section 6 of (RPA), as amended by (NFMA)..."*

This appendix does present information about the unroaded areas to disclose the environmental effects of allocating each area to continued unroaded status or to some level of development (of all or a portion) of each

area. To do this, this appendix presents a description of the environment, presents the proposed management allocation for each of the alternatives, and discloses the environmental consequences of those alternatives for each area. If roads, timber harvest, or other development occurs in these areas, they will no longer be eligible for consideration for wilderness. This itself may be a significant environmental consequence. For this reason, we are considering each area's attributes as a wilderness, such as its capability, availability, and need, so that any decision to designate the area for particular uses will be made with full knowledge of its environmental consequences.

Table C-1 on the following page lists the current status of the original RARE II areas. The column titled "Present Roadless Acres" represents the number of acres which (a) were originally included in the larger more contiguous RARE II areas, (b) were not assigned wilderness status under the Oregon Wilderness Bill of 1984, and (c) are of sufficient size, location, and character as to warrant consideration for roadless management. Also included are the Larch and Roaring River roadless areas which will be evaluated for unroaded management. The small roadless portion of Mt. Jefferson not designated as wilderness will be analyzed with Olallie. One of the RARE II areas, Big Bend, is within the Bull Run Watershed and is to be managed in accordance with the Bull Run Planning Unit FEIS (1/79). That plan recommends the areas be allocated to watershed management and research. Thus, eleven roadless areas are to be analyzed in this appendix.

Table C-2 is presented after Table C-1 and shows, by alternative, which areas will remain unroaded during the entire 150 year planning horizon. Following Table C-2 is an area-by-area discussion. The following information is presented for each area:

- The specific description of each unroaded area including a map.
- Tables which indicate for each unroaded area the proposed management allocation by alternative.
- Tables which present the first decade timber harvest and roading schedule for each alternative.
- A discussion of environmental consequences associated with each area.

Mt. Jefferson Additions and Olallie are part of the 12,400 acre Olallie Further Planning Area. They will be considered together in the Appendix C analysis.

Changes Between Draft and Final

Appendix C, FEIS has been revised and updated in the following important ways:

- Current roadless acreages were updated consistant with the 1988 Vegetative Inventory.
- Potential for wilderness was identified for each area.
- The Lake Roadless Area was discussed in detail, and separately from the Big Bend area.
- Timber information for each area was updated consistent with the 1988 Vegetative Inventory.

Table C-1 Changes Since RARE II

Area	Rare II Unroaded Acres	Present Unroaded Acres	Acreage Change	Reason for Change
Badger Creek 06097	27,300	1,700	-900	Cabin Timber Sale
			-300	Highland Timber Sale
			-100	More accurate mapping
			-24,200	Oregon Wilderness Act of 1984
1989 Update		850	-420	Rockgrass Timber Sale
			-430	More accurate maps/mapping
Big Bend 06092	10,200	0	-10,200	Allocated in Bull Run Planning Unit FEIS, 1/79
Bull of the Woods 06098	34,300	11,400	+1,500	Additional unroaded areas
			+2,000	More accurate mapping
			-26,400	Oregon Wilderness Act of 1984
1989 Update		8,860	-180	Arete Timber Sale
			-130	Flicker/Silo Timber Sale
			-30	Tom's Resell Timber Sale
			-60	Riteon Resell Timber Sale
			-50	Ogre Timber Sale
			-70	Roundup Timber Sale
			-10	Regyp Timber Sale
			-310	Ducky Timber Sale
			-1900	More accurate maps/mapping
Eagle 06090	40,600	16,800	+13,900	Addition of Gorge Face to eastern forest boundary
			+1,800	Additional unroaded acres on southeast boundary
			+900	More accurate mapping
			-38,900	Oregon Wilderness Act of 1984
			-1,500	Allocated in Bull Run Planning Unit FEIS, 1/79
1989 Update		17,270	-80	Gneiss Resell Timber Sale
			+550	More accurate maps/mapping
Lake 06091	11,590	0	-10,240	Allocated in Bull Run Planning Unit FEIS, 1/79
1989 Update		1,350		More accurate mapping
Larch Mountain	0	13,900	+13,900	Not part of RARE II, considered in unit planning process
1989 Update		13,120	-80	Grin Timber Sale
			-700	More accurate maps/mapping

Table C-1 Changes Since RARE II (continued)

Area	Rare II Unroaded Acres	Present Unroaded Acres	Acreage Change	Reason for Change
Mt. Hood Additionsl 06093	10,800	16,000	+5,200	More accurate mapping
1989 Update		12,940	-80	Tunic Timber Sale
			-240	Horsefly Timber Sale
			-120	*Tutu Timber Sale*
			-440	Squire Timber Sale
			-140	Bonnet Timber Sale
			-40	Chance Timber Sale
			-20	Beaver Timber Sale
			-90	*Gauntlet Timber Sale*
			-1,890	More accurate maps/mapping
Mt. Jefferson Additions[1] 06101	1,100	300	+100	More accurate mapping
			-900	Oregon Wilderness Act of 1984
Olallie[1] 06099	8,700	7,800	-900	More accurate mapping
Mt. Jefferson Additions/Olallie 1989 Update		7,770	-30	More accurate maps/mapping
Roaring River	0	29,600	+29,600	Not part of RARE I, considered in unit planning process
1989 Update		27,250	-40	Sturgeon Timber Sale
			-550	Mitchell Flats Timber Sale
			-230	Blondy/Mitchell Flats Timber Sales
			-50	Lookout Resell Timber Sale
			-1,480	More accurate maps/mapping
Salmon-Huckleberry 06095	68,200	20,300	-2,000	Salmon Timber Sale units resulted in inability to manage entire Salmon River Meadow extension
			-1,500	Sci-Fi, Crowfoot and Baldy Timber Sales
			-44,800	Oregon Wilderness Act of 1984
			+400	More accurate mapping
1989 Update		17,650	-40	Amos Timber Sale
			-150	Wilder Timber Sale
			-150	Alley Timber Sale
			-290	Eager Timber Sale
			-110	Cool Creek Timber Sale
			-200	Tighttrack Timber Sale
			-1,700	More accurate maps/mapping

Table C-1 Changes Since RARE II (continued)

Area	Rare II Unroaded Acres	Present Unroaded Acres	Acreage Change	Reason for Change
Twin Lakes 06096	5,400	6,500	+1,100	More accurate mapping
1989 Update		6,090	-410	More accurate maps/mapping
Wind Creek 06094	6,200	5,700	-400	Extension of permit boundary for Multorpor/Ski Bowl Ski Area
			-100	More accurate mapping
1989 Update		5,440	-260	More accurate maps/mapping

[1] *Mt. Jefferson Additions and Olallie are part of the 12,400 acre Olallie Further Planning Area. They will be considered together in the Appendix C analysis.*

Table C-2 Roadless Areas Managed as Roadless for at Least 50 Years

Unroaded Area	Alternatives							
	NC	A	C	E	F	H	I	Q (Preferred)
Badger Creek					X			
Bull of the Woods					X	X	X	
Lake (without Bull Run)					X	X	X	X
Larch	X	X	X	X	X	X	X	X
Mt. Hood Additions							X	
Olallie	X	X		X	X	X	X	X
Roaring River						X	X	
Salmon-Huckle-berry					X	X	X	
Twin Lakes					X	X	X	X
Wind Creek					X	X	X	X
Eagle	X	X	X	X	X	X	X	X

Table C-3 Acres of Roadless Area at End of Fifth Decade*

Roadless Area	Existing Acres	Alternatives							
		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	16,270	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

** Acres remain the same in decades 1 through 5.*

Map A-1 Badger Creek Roadless Area

Badger Creek

Badger Creek (06097), 850 Acres

Description

History

The Badger Creek unroaded area was inventoried through both the RARE I and II processes. The area was allocated to dispersed unroaded recreation and multiple-use management in the Badger Jordan Planning Unit FEIS (2/78) although it was not implemented until the RARE II allocation of the area to non-wilderness use.

Fourteen thousand acres of Badger Creek were proposed for wilderness in the Oregon Wilderness Bill of 1979 (S-2031) with the whole area included in the Oregon Wilderness Bill of 1983 (HR-1149). The vast majority of the area (24,300 acres) became wilderness under the Oregon Wilderness Act of 1984.

Location and Access

The Badger unroaded area is located on the Barlow Ranger District within Hood River county. It is located approximately 15 miles southwest of The Dalles and 30 miles east of Portland.

With the exception of the larger unroaded piece north and east of Grasshopper Point, the small remaining unroaded portions are the results of establishing the wilderness boundary on topographic features above Badger Creek. Their small size and location combine to eliminate them from further description and analysis. The larger piece will be described and analyzed as a potential unroaded area.

Specifically, access to Grasshopper Point is via a primitive Forest road (4860). A trail within the wilderness provides hiking access from the north, via Trail #466 (Three Mile), with Trail #475 (Rocky Butte) traversing the roadless area in the south, which is used by hikers and motorized bikes.

Physiography and Soils

The unroaded area slopes east from a dominant ridge. The headwaters of Three Mile Creek and several smaller drainages are within the area. Elevation ranges from approximately 5000 feet to 5360 feet near Grasshopper Point.

Soils are deep glacial deposits with areas of shallower soils and rock outcrops. The soil profile is gravelly, sandy loam.

Vegetation

The area is primarily forested with scattered small stringer meadows. The primary species at this upper elevation are western hemlock, Pacific silver fir, noble fir, lodgepole pine, western white pine, Douglas-fir, and grand fir. The understory contains beargrass, huckleberry, sedge, and other shrubs/forbs.

Current Uses

Management direction for the area is general forest (Badger-Jordan Planning Unit FEIS, 2/78). The management goals are to produce timber and forage.

The primary use is dispersed roaded recreation associated with Forest Road 4860 that defines the western boundary. The area is used by hunters and recreationists viewing scenery. Grasshopper Point affords excellent views of both the agricultural land to the east and Mt. Hood. There is motorcycle and four-wheel drive vehicle use along the road and motorbike use on Trail #475.

The area is a part of the Grasshopper Cattle allotment and affords some grazing use, particularly in the stringer meadows.

Surroundings and Attractions

The northern boundary is the Badger Creek Wilderness with the remaining boundaries a forest road and lands managed for timber emphasis.

The primary attractions are the excellent views and the opportunity to travel on a primitive road.

Capability

Manageability and Boundaries

This area adjoins the Badger Creek Wilderness with its capability to be managed as an unroaded area a function of this relationship. The wilderness/unroaded interface is a broad east-west ridge. Forest Road 4860 forms the western boundary. The southern boundary contours off the ridge with the eastern boundary following a section line back to the wilderness boundary. The area is exposed to activities occurring on the road and those associated with nearby timber harvest (both sights and

sounds). It does not appear to provide a logical extension, nor act as a buffer to the wilderness.

Natural Integrity and Appearance

The overall development of the Grasshopper piece is low, consisting of a trail. There is evidence of recreation and grazing use. Past and present harvest activities are observable from the area. These features affect less than 10% of the area. Natural ecological processes have not been greatly altered.

Opportunities for Solitude, Primitive Recreation and Challenge

There would be low opportunities for solitude (and recreation challenge) because of the close proximity to roads, trails, and timber harvest activities. Primitive recreation opportunities would be low to moderate.

Special Features

There are no known sensitive plant or animal species identified in the remaining unroaded area.

Availability

Recreation

The primary forms of recreation use are associated with Road 4860 and Trail 475. An unroaded prescription would eliminate motorized vehicles on the trail. Estimated carrying capacity by ROS class is as follows:

ROS Class	Capacity in RVDs/Year
RN	1000
RN	4265

Wildlife and Fish

The unroaded area has the capability of providing habitat for deer, elk, and turkey, as well as a variety of non-game species. There are no fish bearing streams present.

Water

The area is located in the White River basin and forms the headwaters of Three Mile and Gate Creeks. Though ephemeral in these upper reaches, the creeks do provide water for irrigation of the agricultural lands to the east.

Livestock

The unroaded area falls within the Grasshopper Cattle Allotment. The potential of the area for forage production is low as is the estimated current livestock use.

Timber

In aggregate, the five discrete areas contain approximately 750 acres of land suitable for timber production. There is a current standing volume of 4.4 million cubic feet. The potential long run sustained yield from this area under intensive timber management would be 4.1 million cubic feet per decade. Specific to the Grasshopper piece, primary species are western hemlock, Pacific silver fir, and noble fir in unevenaged stands. There are also inclusions of mature evenaged noble, Pacific silver fir and western hemlock.

Minerals and Energy

(H=High, M=Medium, L=Low)	
Leasable	
Lease Application Area (Acres)	
Geothermal	-
Oil and Gas	-
Resource Potential	
Geothermal	L
Oil and Gas	L
Locatable	
Number of Claims	-
Mineral Potential	L
Saleable	
Rock Materials Resource Potential	L

The potential for geothermal exploration and development is low. There have been lease applications available for oil and gas in the past. However, the potential for exploration and development of oil and gas is low.

There is some evidence of locatable mining activity in adjacent areas. The potential for exploration and development within the unroaded area is, however, low.

Fire

Due to fire exclusion ladder fuels in this area present a potentially serious wildfire situation. Management con-

siderations include the use of scheduled and prescribed fire to help return stands to a more natural condition.

Insects and Disease

The area was included in a forest level Western Spruce Budworm Study in 1983-84. There is a high probability for the area to develop epidemic populations of spruce budworm. In the past, small areas located along the upper Badger Creek drainage have been subject to Mountain Pine and Fir Engraver Beetle outbreaks.

Need For Roadless Areas

Directly north of the Grasshopper piece is the Badger Creek Wilderness. Other nearby wilderness includes the Mt. Hood and Salmon-Huckleberry to the west. There are also two areas that have been managed as unroaded to the west: Twin Lakes and Wind Creek areas. The ecosystems present in the Grasshopper piece (or any of the other pieces) are represented in the adjacent wilderness.

There has been no expression of public sentiment for maintaining these pieces of land in unroaded management since passage of the Oregon Wilderness Act.

Environmental Consequences

Table C-4 indicates the different management allocations, by alternative, for the Badger unroaded area. Table C-5 presents the first decade timber harvest and roading schedule by alternative.

All of the remaining areas through the following discussion are focused on the Grasshopper piece. Alternative F allocates the area primarily to unroaded dispersed recreation, which perpetuates the unroaded character of the area.

Alternatives H and I allocates the area to primarily to special old growth and unroaded dispersed recreation respectively; however, the acreage is not sufficient to maintain unroaded qualities.

Alternatives, C and E allocate the entire area to timber emphasis, and alternatives A, NC, and Q allocate the area primarily to timber emphasis. In all cases, the unroaded character would be lost.

Potential for Wilderness

Alternative F would perpetuate the unroaded character of the area and provide future opportunities for addition to the Badger Creek Wilderness. Alternatives A, NC, C, E, H, I, and Q do not maintain the unroaded character, nor do they provide the opportunity for addition to Badger Creek Wilderness.

Table C-4 Management Acres for Badger Creek by Alternatives

Management Areas	Alternative							
	NC	A	C	E	F	H	I	Q (Preferred)
A5 Unroaded Recreation	0	0	0	0	840	0	510	0
A7 Special Old Growth	0	0	0	0	0	670	0	0
B2 Scenic Viewshed	40	40	0	0	0	0	0	0
B4 Pine Oak Habitat	0	0	0	0	0	160	160	170
B10 Winter Range	0	0	0	0	0	0	150	0
B11 Deer & Elk Summer Range	0	0	0	0	0	0	30	0
C1 Timber Emphasis[1]	810	810	850	850	10	20	0	680

[1] *Acres shown do not include all allocations for Management Requirements.*

Table C-5 Estimated First Decade Harvest and Roading Schedule

	Alternatives							
	NC	A	C	E	F	H	I	Q (Preferred)
Suitable Acres Roaded/Harvested	73	73	75	75	1	9	15	68
MMCF Harvested	0.43	0.43	0.44	0.44	0.005	0.052	0.088	0.40
Roading Cost ($MM)	0.242	0.242	0.242	0.242	0.242	0.05	0.099	0.242

Map A-2 Bull of the Woods Roadless Area

Bull of the Woods

Bull of the Woods (06098), 8,660 Acres

Description

History

Bull of the Woods was studied in both the RARE I and RARE II processes. It was not included in the final list of candidate Wilderness Study Areas by RARE I. In the RARE II inventory, the Bull of the Woods Roadless Area was expanded to 34,300 acres, including the Opal Creek area on the Willamette National Forest. With completion of RARE II, 23,700 acres of the area was recommended for wilderness including the long-established recreation area: Bull of the Woods Scenic Area.

Bull of the Woods was evaluated under the Clackamas Planning Unit Environmental Statement. This unit plan was discontinued before completion of a final document and was phased into the current Forest planning process.

Bull of the Woods was proposed for a wilderness suitability study under the Oregon Omnibus Wilderness Act of 1977 (S-658). Twenty-six thousand acres were proposed for wilderness in the Oregon Wilderness Bill of 1979 (S-2031) and 47,000 acres in the Oregon Wilderness Bill of 1983 (HR-1149). The vast majority of the area (26,400 acres) became wilderness under the Oregon Wilderness Act of 1984.

Location and Access

Bull of the Woods is located on the Estacada and Clackamas Ranger Districts within Clackamas and Marion Counties. There are three separate pieces that remain after the passage of the Oregon Wilderness Act. Piece A is east of Schreiner Peak and Janus Butte, bounded on the north by Road 6340 (6340140), and on the east and south by Roads 6300, 6380, and 6370. The second piece, piece B, is east of Burnt Mountain, bounded by the Forest boundary on the west and south, and Roads 7040 and 7030 on the north and east. The final piece, C, is the Bagby Hot Springs area, north of Spray Creek to Road 70. The eastern and western boundaries are Roads 6841 and 7020, respectively. There are several small unroaded areas that are the result of establishing the wilderness boundary on topographic features. Their small size and general location combined eliminated them from further description and analysis.

Primary access is Road 63 to piece A, and Roads 7040 and 7030 to piece B and Road 70 to piece C. Generally, the area is 70 miles southeast of Portland and 65 miles west of Salem. Trail access is limited in pieces A and B.

Physiography and Soils

The portion east of Schreiner Peak/Janus Butte, (piece A), is a northeast facing slope. The slopes are highly dissected with tributaries into the Collowash and East Fork Collowash Rivers. Elevations range from approximately 2200 feet near the Collowash to 5540 feet at Schreiner Peak. Piece B is a northwest-southeast ridge sloping northeast from Burnt Mountain with a prominent north-south ridge located in the approximate middle of the area. Elevation ranges from 3080 feet to 4796 feet at Burnt Mountain. The last piece, C, is divided by the Hot Springs fork of the Collowash River with resulting east and west facing slopes. Elevation ranges 2272 feet at Bagby Hot Springs to 3600 feet.

Generally, soils are sandy or silt loams associated with steep, glaciated sideslopes. In the Bagby area soils tend to gravelly loam. Unvegetated talus slopes and rock outcrops occur in pieces A and B.

Vegetation

Vegetation is varied for the three areas. In area A, lower elevations support tree species including Douglas-fir, western hemlock, and western red cedar. Higher elevations support noble fir, Pacific silver fir, and mountain hemlock. There is some sugar pine in the area. The area near Burnt Mountain, piece B, supports tree species that include Douglas-fir, western hemlock, mountain hemlock, noble fir and Pacific silver fir. There is Alaska yellow cedar in this area. The Bagby piece, C, is predominantly Douglas-fir, western hemlock, western red cedar and red alder. The understory across the three areas varies, but includes rhododendron, huckleberry, salal, and other shrub and forb species.

Current Uses

Primitive and semi-primitive recreation opportunities exist in a predominantly natural environment. Current use of piece A is recreation: hiking and fishing. This use is localized and associated with the existing trails and Collowash River. The recreational use of piece B is very limited with perhaps some activity on the abandoned Burnt Mountain Trail. The Bagby piece, however, receives heavy recreational use. The Bagby Hot Springs provides opportunities to hike and bathe with use estimated at 8,000 RVDs per year. In addition to

the recreation use, a Research Natural Area exists in piece C.

Surroundings and Attractions

The remaining unroaded areas are surrounded by general Forest land and, excepting piece B, the Bull of the Woods Wilderness. Piece B is adjacent to the wilderness but does not share a common boundary. It also adjoins other ownership: BLM and private lands.

The primary attractions in the areas are the Bagby Hot Springs and the rivers: Hot Springs Fork of Collowash, Collowash, and East Fork of Collowash. Schreiner Peak is a popular hiking destination.

Capability

Manageability and Boundaries

All three areas could be managed in an undeveloped condition in compliment with the Bull of the Woods Wilderness. The Schreiner/Janus area is of a size to be managed as an unroaded area independent of the wilderness. The Burnt Mountain piece is not a logical extension of the wilderness and its small size and proximity to other ownership and management activities make it a marginal candidate for unroaded management. The Bagby piece, while it could be managed as an unroaded area, is highly developed near the Hot Springs. Access, via roads, is adequate for each of the areas.

Natural Integrity and Appearance

The overall development of the Bull of the Woods unroaded area is low for pieces A and B, and high for piece C. Development in A and B is limited to trails (unmaintained in piece B). In piece C there is a development in the form of trails, a guard station, and bathhouses serving Bagby Hot Springs. These features affect less than 10% of pieces A and B, and more than 25% of piece C. Natural ecological processes have not been greatly altered in any of the areas.

Opportunities for Solitude, Primitive Recreation and Challenge

The opportunity for solitude is moderate for piece A. This opportunity is decreased in piece B because of size and proximity to off site intrusions including roads and harvest activities. Travel off the existing trail systems would be physically demanding and offer some challenge in pieces A and B. There are limited opportunities for solitude away from the Hot Springs in piece C. The Hot Springs provides a rural recreation experience with other visitor contact nearly guaranteed.

Special Features

A log Ranger Station is located at Bagby Hot Springs. Current renovation of the Springs has retained some of the original tubs and is perpetuating the architectural style of the earlier era. The area is eligible for designation to the National Register of Historic Places. There are mines, predating the 1900's, in piece A. One prehistoric site has been located in the unroaded area with a high probability that others exist. The Bagby Research Natural Area is located in piece C.

There are no known sensitive plant or animal species identified in the area.

Availability

Recreation

These remaining three pieces provide a diversity of recreational opportunities; from primitive off trail hiking to bathing at the popular Bagby Hot Springs. Estimated carrying capacity by ROS class is as follows:

ROS Class	Capability in RVDs/Year
RN	1,152
RM	21,531
SPNM	8,587

Wildlife and Fish

The area has the capability of providing wildlife habitat for the following management indicator species: spotted owl, pine marten, ruffed grouse, pileated woodpecker, and deer/elk. Though habitat diversity is increased by rivers and meadows, habitat quality is decreased by poor soil, steep slopes and high elevations.

The Bull of the Woods area provides high quality fisheries habitat. The larger streams in the area support major runs of steelhead, spring Chinook and coho salmon. Maintenance of self-sustaining fish populations and downstream water quality are management issues in the area.

Water

Tributaries and streams on the east side of Schreiner/Janus flow into the East Fork and Collowash Rivers. The area near Burnt Mountain drains into Hugh and Nohorn Creeks. The Bagby area feeds the Hot Springs fork of the Collowash River. Each of the pieces is in the Collowash river drainage.

Timber

The area contains approximately 5,433 acres of land suitable for timber production. Species are Douglas-fir, western red cedar, western and mountain hemlock, noble fir and Pacific silver fir. There is a current standing volume of 63 million cubic feet. The potential long run sustained yield from this area under intensive timber management would be 45.5 million cubic feet per decade.

Minerals and Energy

(H=High, M=Medium, L=Low)	
Leasable	
Lease Application Area (Acres)	
Geothermal	200
Oil and Gas	-
Resource Potential	
Geothermal	M
Oil and Gas	L
Locatable	
Number of Claims	2
Mineral Potential	M
Saleable	
Rock Materials Resource Potential	L

The "Geothermal Leasing - Clackamas Area Environmental Assessment Report (3/81)" analyzed existing lease applications near the Bull of the Woods unroaded area. The results of this study, and the proximity to the Breitenbush Known Geothermal Resource Area (KGRA) indicate a moderate potential for geothermal exploration and development. There is low potential for oil and gas exploration and development.

Historically, the area has been explored and mined for precious metals. There are two claims within the unroaded area and a moderate potential for prospecting and development.

Fire

Fuels in the area are predominately sparse undergrowth with a thin layer of ground fuels. Fires burning in these fuels would generally be of low intensity with low spread rates, except in patches where down woody material is concentrated.

Insects and Disease

There have been no significant insect or disease outbreaks in the area. There is evidence of spruce budworm activity. The potential is low for extensive damage or significant outbreaks of insects or disease.

Need for Roadless Areas

The Schreiner/Janus and Bagby pieces have a boundary shared with the Bull of the Woods Wilderness. The Burnt Mountain piece adjoins the wilderness at one corner. The Mt. Jefferson Wilderness is nearby as is the Ollalie Scenic Area. The ecosystems present in the Bull of the Woods unroaded area are similar to those in the wilderness. The Bagby Research Natural Area provides ecosystem representation for Douglas-fir forests approximately 250 years old.

The public involvement process during RARE II, development of the Clackamas Unit Plan, and project level analyses indicated an interest in ensuring primitive recreation opportunities. The Bagby area, in particular, has had continued public support for management in an undeveloped condition.

Environmental Consequences

Table C-6 indicates the different management allocations, by alternative, for the Bull of the Woods unroaded area. A second table, Table C-7, presents the first decade timber harvest and roading schedule by alternative. (The Bagby Research Natural Area is common to all alternatives.)

None of the alternatives allocate the entire area to prescriptions that maintain the unroaded qualities. Alternatives F and I allocate approximately 80% of the area to unroaded dispersed recreation. The SIA has been designed to maintain Bagby Hot Springs at a moderate level of development as an unroaded area in all alterna-

tives except A and C. Alternative H allocates 85% of the area to special old growth.

Alternatives A, C, NC, and E propose greater than 80% of the areas as timber emphasis, and Alternative Q allocates 65% of the area to special emphasis watershed. All five alternatives would manage the Bagby Hot Springs as an SIA. The level of timber harvesting associated with these alternatives would eliminate the unroaded condition of the areas, and change the recreation opportunity (ROS) class to roaded natural/roaded modified.

Potential for Wilderness

Alternatives F, H, and I would provide opportunities for future additions to the Bull of the Woods Wilderness. Alternatives A, NC, C, E, and Q eliminate the potential for future addition to the Bull of the Woods Wilderness.

Table C-6 Management Acres for Bull of the Woods by Alternative

Management Areas	Alternative							
	NC	A	C	E	F	H	I	Q (Preferred)
A3 Research Natural Area	340	420	570	560	550	560	560	540
A4 Special Interest Area	430	180	0	550	520	690	710	590
A5 Unroaded Recreation	0	0	0	0	6,890	0	6,900	0
A7 Special Old Growth	0	0	0	0	150	7,400	0	140
A8 Northern Spotted Owl Habitat	0	0	0	0	0	0	0	910
A9 Key Site Riparian Area	160	360	0	0	40	0	0	50
B2 Scenic Viewshed	0	420	160	160	390	0	0	330
B6 Special Emphasis Watershed	0	0	0	0	110	0	0	5,670
B8 Earthflow	0	0	0	160	0	10	70	200
B10 Winter Range	0	0	0	0	0	0	70	0
B11 Deer and Elk Summer Range	0	0	0	0	0	0	350	0
C1 Timber Emphasis[1]	7,730	7,280	7,930	7,230	10	0	0	230

[1] *Acres shown do not include all allocations for Management Requirements.*

Table C-7 Estimated First Decade Harvest and Roading Schedule

	Alternative							
	NC	A	C	E	F	H	I	Q (Preferred)
Suitable Acres Roaded/Harvested	490	468	498	459	5	0	15	200
MMCF Harvested	5.68	5.43	5.77	5.32	0.062	0.0	0.018	2.32
Roading Cost ($MM)	1.27	1.27	1.27	1.27	0.00	0.00	0.00	1.05

Map A-3 Eagle Roadless Area

Eagle

Eagle (06090), 17,270 Acres

Description

History

Through the RARE I inventory process two major acreages in the Columbia Gorge were identified as unroaded, Gorge (#608) and Eagle (#607). The Eagle Roadless Area met the criteria for designation as a new Wilderness Study Area. However, it was not included in the final recommendations because of the near completion of the Eagle Creek Planning Unit FEIS (1/75).

This unit plan aggregated the two RARE I areas and established management direction for some 69,200 acres. The final environmental statement recommended 40,900 acres as a Wilderness Study Area. This study area was a portion of the original Eagle Roadless Area. The remaining acres (portions of Eagle and all of Larch Roadless Area) were classified for scenic and landscape management.

The RARE II process inventoried only the recommended wilderness study area. As a result of this process, 41,200 acres were allocated for wilderness uses.

The Eagle area was included in the Oregon Wilderness Act of 1979 (S-2031), and in the Oregon Wilderness Bill of 1983 (HR 1149). The area that remains unroaded after passage of the Oregon Wilderness Bill (1984) is predominantly the face of the Columbia Gorge with two small pieces on the eastern boundary.

Location and Access

The Eagle area is located on the Columbia Gorge and Hood River Ranger Districts almost entirely within Hood River County. It is 40 miles east of Portland and 15 miles west of Hood River.

The northern perimeter extends from Eagle Creek campground near Interstate 84, eastward along the Gorge to Viento State Park. The southern boundary, with the exception of a corridor along the Eagle Creek Trail, follows steep topography one to one and one-half miles from the Columbia River. One of the pieces on the eastern boundary is located southeast of Mt. Defiance and the other is south of Black Lake.

Primary road access is via Interstate 84 and Forest Roads 2820, 2821, and 2810. A variety of horse and hiker trails access the area including Eagle Creek and the Pacific Crest Trail.

Physiography and Soils

The face of the Columbia Gorge is characterized by spectacular basalt cliffs, rocky toeslopes and rock outcroppings. The Mt. Defiance/Black Lake area is nearly level to sloping glaciated uplands. The majority of the topography is very steep and rugged ranging from 800 feet to 4960 feet at Mt. Defiance. Soils on the steep, north facing slopes are of igneous formation and are extremely stony, cobbly loams. Soils in the Mt. Defiance/Black Lake area are unconsolidated glacial till forming sandy and silt loams.

Vegetation

The majority of the area is forested. Douglas fir, western hemlock, western red cedar, red alder, noble fir and Pacific silver fir characterize the face of the Gorge. The understory shrub/forb layer is extremely diverse: vine maple, huckleberry, salal, Oregon grape, Oxalis, swordfern, bracken fern, trillium, vanilla leaf and others. At the upper elevation of Mt. Defiance/Black Lake, tree species include mountain hemlock, Pacific silver fir, noble fir, and lodgepole pine. The understory contains more mesic species such as service berry, rhododendron, and beargrass.

Current Use

General management policy (Eagle Creek FEIS, 1/75) established a Special Interest Zone - Scenic for the majority of the Eagle unroaded area. This zone is managed to preserve and protect special scenic values and unique natural features.

Activities along the Gorge face include hiking, picnicking, viewing scenery, and automobile touring. Mt. Defiance and Black Lake afford excellent opportunities to view scenery.

Surroundings and Attractions

The northern boundary of the area, the Gorge face, approaches the freeway, frontage roads, railroads, communities, and powerlines. The southern boundary is the Columbia Wilderness. To the east is non-National Forest land. Adjacent to the western boundary (Eagle Creek) are lands managed for scenic qualities. The Defiance/Black Lake areas are bounded by the Columbia Wilderness and general forest lands.

Major attractions include the Eagle Creek Trail and associated waterfalls, other trail systems, and a variety of historic sites. The unique geology and scenery couple to make the face of the Gorge a much visited area.

Capability

Manageability and Boundaries

The larger face of the Gorge area could be managed in an undeveloped condition. The boundaries, inherited from wilderness designation to the south and development (roads) to the north, form a manageable unit. The two smaller areas on the eastern boundary could be managed in undeveloped condition though they will be exposed to adjacent management activities (electronic site, roads, timber harvest). All of the remaining Eagle unroaded area provide a buffer to the Columbia Wilderness.

Natural Integrity and Appearance

The overall development of Eagle unroaded area is low. Development includes trails, recreation facilities, power lines and past timber harvesting. These features affect less than 10% of the area. The Eagle area, away from locations of concentrated use, is natural appearing with ecological processes not greatly altered.

Opportunities for Solitude, Primitive Recreation and Challenge

Opportunities for solitude and primitive recreation for the face of the Gorge portion are moderate to high with the exception of popular hiking trails. The vegetation and terrain effectively screen users from one another and create recreational challenges off of established trails. Off-site intrusions are observable, particularly at the lower elevation along the northern boundary. The Mt. Defiance/Black Lake area provides little opportunity for solitude, primitive recreation or challenge.

Special Features

Adjacent to the area, there are several historic features that have been listed on the National Register of Historic Places. These are the Eagle Creek campground, Columbia Gorge Work Center, and Columbia Gorge Old Wagon Road. In addition, Mt. Defiance is a former fire lookout site. Since little of the area has undergone surveys, other sites, especially prehistoric ones, probably occur in the area.

Biologically, the area is very diverse providing habitat for endemic animal and plant species such as the Larch Mountain Salamander. There are more than ten plant species currently on the Region's sensitive list found in the Columbia River Gorge.

Availability

Recreation

The Eagle unroaded area provides a range of recreation opportunities. The popular trail systems are heavily used with the steep, timbered slopes largely unexplored. Estimated carrying capacity by ROS class is as follows:

ROS Class	Capacity in RVDs/Year
RN	36,370
RM	5,695
SPNM	10,465
R	3,655

Wildlife and Fish

The area has the capability to provide habitat for the following management indicator species: spotted owl, pine marten, pileated woodpecker, ruffed grouse and deer/elk. A wintering population of bald eagles is sometimes present along the northern boundary. At elevations below 2400 feet, the area may provide critical winter range for deer and elk.

The Columbia River Gorge is the southern limit of many northern plant and animal species and the northern limit of typically southern species. Also, the sea level passage through the Cascades allows mingling of eastern and western elements. These influences provide great habitat diversity.

The area encompasses quality fish habitat that supports populations of anadromous fish and resident trout. Fisheries objectives include maintenance and enhancement of water quality for self-sustaining fish populations and for two hatchery facilities on Eagle and Herman Creeks.

Water

The area is within the Columbia River Basin. Eagle Creek, Herman Creek, and a variety of other tributaries drain the area. The Mt. Defiance/Black Lake pieces drain east into the Hood River. There is a small

hydroelectric project proposed for Gorton Creek. The potential for further exploration and development in the area is moderate.

Timber

The area contains approximately 11,150 acres of land suitable for timber production. Species include Douglas-fir, western hemlock, western red cedar, noble fir, and Pacific silver fir.

There is a current standing volume of 89.7 million cubic feet. The potential long run sustained yield from this area under intensive timber management would be 6.7 million cubic feet per decade.

Minerals and Energy

(H=High, M=Medium, L=Low)	
Leasable	
Lease Application Area (Acres)	
Geothermal	-
Oil and Gas	-
Resource Potential	
Geothermal	L
Oil and Gas	L
Locatable	
Number of Claims	10
Mineral Potential	L
Saleable	
Rock Materials Resource Potential	M

The potential for geothermal and oil and gas exploration and development is low. There have been a number of claims filed for locatable materials. However, the potential for continued exploration or development is low.

Fire

Fuels in the area generally are thin ground fuels with occasional areas of concentrated woody material. Fires burning in these fuels would be generally of low intensity with low spread rates.

Insects and Disease

There have been outbreaks of balsam woolly aphid in the past. There is evidence of spruce budworm activity in the Mt. Defiance/Black Lake area. The potential is low for further damage or significant insect and disease outbreak.

Land Use

There is a 120 acre inholding of private land near Vienta State Park (T2N, R9E, Sec. 3). This piece is part of an ongoing land exchange and should be acquired by the end of the calendar year.

Though excepted from the unroaded area, there is an electronic site on Mt. Defiance.

Need for Roadless Areas

Directly south of Eagle unroaded area is the Columbia Wilderness. Other nearby wildernesses are: Indian Heaven, Trapper Creek, Mt. Hood, Salmon-Huckleberry, and Badger Creek. In addition, there are several sizeable areas to the south that have historically been managed as dispersed unroaded recreation: Wind Creek and Twin Lakes. The ecosystems within Eagle are represented in the adjacent wilderness.

The Eagle Creek Planning Unit, a unit plan completed in 1975 analyzed public response pertinent to land allocations in the area. There was divided opinion on wilderness and Special Interest - Scenic classification.

Environmental Consequences

Table C-8 indicates the different management allocations, by alternative, for the Eagle unroaded area. Table C-9 presents the first decade timber harvest and roading schedule by alternative.

All Alternatives maintain the current unroaded character of approximately 90% - 95% of the area through allocation to a scenic area or scenic area Northern Spotted Owl area. The scenic area is designed to retain the current level of development.

The area allocated to timber emphasis is in the southern and eastern portions of the Mt. Defiance and Black Lake pieces, respectively. For alternatives C, NC, E, and Q about 90% of the area will be managed by prescriptions that protect the unroaded qualities. The area available for timber harvest through either dispersed roaded recreation, scenic viewshed or timber emphasis allocations is located in the Mt. Defiance, Black Lake, and Larch Mtn. areas. In addition, the face of the Gorge would be available for addition to the wilderness or continued unroaded management.

Potential for Wilderness

All alternatives maintain the unroaded qualities and allow for future addition to the Columbia Wilderness.

Table C-8 Management Acres for Eagle by Alternative

Management Areas	Alternative							
	NC	A	C	E	F	H	I	Q (Pre-ferred)
A4 Special Interest Area		350	0	220				
A5 Unroaded Recreation	390	0	0	430	1,670	380	1,680	650
A6 Semi-Primitive Roaded Recreation				130				130
A7 Old Growth	0	0	0	0	0	540	20	
A9 Key Site Riparian		40	40	40	20			40
B2 Scenic Viewshed	180		0	0	0	0	0	
B3 Roaded Recreation	0	0	0	100	0	0	0	
B11 Deer & Elk Summer Range							50	
B12 Timber Emphasis								110
C1 Timber Emphasis	1,020		1,730	860	30	820	0	820
EA1 Scenic Area	15,650	15,650	15,450	15,450	15,480	15,480	15,480	8,200
EA4 Special Interest Area	10	10	10	10	10	10	10	10
EA8 Northern Spotted Owl Habitat								7,280
EA12 Outdoor Recreation Area	20	30	40	30	40	40	30	30

Note: Acres shown do not include all allocations for Management Requirements

Table C-9 Estimated First Decade Harvest and Roading Schedule

	Alternative							
	NC	A	C	E	F	H	I	Q(Pre-ferred)
Suitable Acres Roaded/Harvested	72	0	112	59	3	53	2	56
MMCF Harvested	0.58	0.00	0.09	0.47	0.02	0.04	0.01	0.05
Roading Cost ($MM)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Map A-4 Lake Roadless Area

Lake

Lake (06091), 11,590 Acres

Description

History

The Lake unroaded area was inventoried through both RARE I and II processes. This area is administratively divided into two areas: approximately 10,240 acres were allocated to Watershed Management, Bull Run Lake Basin (includes the Bull Run Natural Area), and General Forest special area management in the Bull Run Planning Unit Final Environmental Impact Statement (FEIS, 1/79). The remaining 1350 acres is outside the Bull Run Management Unit Boundary.

Location and Access

The Lake unroaded area is located on the Columbia Gorge and Hood River Ranger Districts within Hood River, Multnomah, and Clackamas Counties. It is located approximately 30 miles east of Gresham and 40 miles east of Portland.

This area is bounded by the following geographical features: Hiyu Mtn., Forest Road (FR) 1025, Preacher's Peak, FR 1015 and FR 20 along the west; FR 2030 along the north; and Table Mtn., Blue Lake, Lost Lake and Sentinal Peak along the east.

Physiography and Soils

The unroaded area slopes primarily west from a dominant ridge. The headwaters of Bull Run River and some tributaries are within the area. About ten percent of the area slopes east of the dominant ridge towards Lost Lake and tributaries of the West Fork of Hood River.

Soils are deep glacial deposits with areas of shallower soils and rock outcrops. The soil profile is gravelly, sandy loam.

Vegetation

The Area ranges from about 3000 to 4500 feet, and contains a diverse array of forested and non-forest ecosystems. At the lower elevations, Western Hemlock Zone forests are found, while at upper elevations elements of the Pacific Silver Fir and Mountain Hemlock zones occur. Streamside, lakeshore and wetland riparian areas occur, in addition to sparsely vegetated areas on rocky peaks. The southern portion contains the Bull Run Research Natural Area.

Current Uses

Management direction for most of the area (approximately 10,240 acres) is described in the Bull Run Planning Unit FEIS, 1/79 as Watershed Management, Bull Run Lake Basin, and General Forest. The remainder of the area (approx. 1350) is under the direction of the Hood River Ranger District Multiple Use Plan.

Use is separated by the two administrative areas: inside and outside the Bull Run Management Unit Boundary. Use outside the Bull Run Management Unit encompasses part of Lost Lake, a heavily used destination campground, and other dispersed recreation associated with Forest Roads 13 and 1340. The area inside the Bull Run Management Unit is closed to public entry, with the exception of traveling on the Pacific Crest National Scenic Trail (PCNST) which traverses approximately 10 miles of the eastern portion of the area.

Surroundings and Attractions

The northeastern boundary is separated from the Columbia Wilderness (formed from Eagle Roadless Area, #06090) by a primitive ridgetop road.

As previously described the vast majority (approx. 87%) of the area is closed to public entry.

Capability

Manageability and Boundaries

This unroaded area is large enough (11,590 acres) to be managed in an undeveloped condition and provide semi-primitive/roaded natural recreation settings if it were open to public entry; however, only 13% of the area or approximately 1350 acres is open for public access. The wilderness/unroaded interface is a ridgetop, primitive road that is closed to public travel; therefore, this area does act as a buffer to the Columbia Wilderness.

Natural Integrity and Appearance

The overall development of the Lake Roadless Area is low. The PCNST traverses approximately 10 miles along the eastern portion of the area. The Lakeshore trail is a heavily used trail around the unroaded portion of Lost Lake. Past blowdown harvest by helicopter is

observable in the area. The combination of these features affect less than 13% of the area. Natural ecological processes have not been greatly altered.

Opportunities for Solitude, Primitive Recreation and Challenge

In the portion open to public entry, there would be little sense of solitude and primitive recreation challenge because of the proximity to roads, trails and timber harvest activities.

Special Features

Three sensitive plant species occur in the area: Tauschia stricklandii, Hieracium longiberbe, and Streptopus streptopoides. The area provides potential habitat for wolverine, a sensitive species, and at least two know pairs of Federally threatened, Northern spotted owls nest in the area.

Availability

Recreation

The primary forms of recreation use are associated with the PCNST and Lakeshore trails, Lost Lake, and roads 13 and 1340. As stated earlier, only 13% or 1350 acres of the 11,590 total is open for public entry. Estimated carrying capacity for ROS class is as follows:

Entire Area (11,590 acres)

ROS Class	Capacity in RVDs/Year
RM	5,051
RN	77,611
SPNM	11,265

Area Open to Public (1,350 acres)

ROS Class	Capacity in RVDs/Year
RM	2,864
RN	10,456

Wildlife and Fish

The Lake area has the capability of providing habitat for deer, elk, and black bear, as well as a variety of non-game species. Small populations of resident trout inhabit some streams. There are no anadromous fish bearing streams.

Water

The area is located primarily in the Bull Run basin and forms the headwaters of Bull Run River.

Livestock

There are no commercial livestock allotments in the area.

Timber

The Lake area contains approximately 7,430 acres of land suitable for timber production. There is current standing volume of 73.9 million cubic feet. The potential long run sustained yield from this area under intensive timber management would be 25.7 million cubic feet per decade. Primary commercial species are Pacific silver fir and Douglas fir.

Minerals and Energy

(H=High, M=Medium, L=Low)	
Leasable	
Lease Application Area (Acres)	
Geothermal	0
Oil and Gas	0
Resource Potential	
Geothermal	L
Oil and Gas	L
Locatable	
Number of Claims	0
Mineral Potential	L-M
Saleable	
Rock Materials Resource Potential	L

The potential for geothermal exploration and development is low. The potential for exploration and development of oil and gas is low.

There is some evidence of locatable mining activity in adjacent area. The potential for exploration and development within the unroaded area is, however, low.

Fire

The area receives a low natural fire occurrence and has a low fire history due to aggressive past fire suppression efforts. Fuels in the area consist of moderate to heavy loading of down woody material from natural accumulation and windthrow.

Insects and Disease

Minor populations of bark beetle infestations occur as a secondary agent on old-growth trees stressed from wind damage. The potential for epidemic populations is low.

Need For Roadless Areas

Directly northeast of Lake unroaded area is the Columbia Wilderness. Other nearby wildernesses are: Indian Heaven, Trapper Creek, Mt. Hood, Salmon-Huckleberry, and Badger Creek. In addition, there are several sizeable areas to the south that have historically been managed for dispersed unroaded recreation: Wind Creek, Twin Lakes, and Salmon-Huckleberry. The ecosystems within Lake are represented in the nearby Wilderness.

Environmental Consequences

Table C-10 indicates the different management allocations, by alternative, for the Lake unroaded area. Table C-11 presents the first decade timber harvest and roading schedule by alternative.

In all alternatives 88% or 10,240 acres were allocated to the Bull Run Watershed Management Unit (Bull Run Planning Unit FEIS 1/79). This allocation maintains the unroaded character of the area. Of the remaining 1,350 acres, alternatives E, F, H, I, and Q maintain between 490 acres (36%) and 1,350 acres (100%) in and unroaded condition. This is achieved through a combination of Special Interest Area, Unroaded recreation, Special old growth, and Northern Spotted Owl Habitat area allocations.

Alternatives A, C, NC, and E allocate between 42% and 93% of the remaining 1,350 acres to timber emphasis. Alternatives A and NC allocate 27% or 370 acres to scenic viewshed. These four alternatives will not maintain the unroaded character of the remaining acreage outside the Bull Run Watershed Management Unit.

Potential for Wilderness

The potential for wilderness designation of the Lake Roadless Area should be examined from two perspectives: those portions outside the Bull Run Management Unit, and those acres inside the Bull Run of the acreage outside the Bull Run Management Unit, only alternatives H and I would maintain potential acres to add to the Columbia Wilderness. When considering the acreage inside the Bull Run Management Unit, all alternatives would maintain potential additions to the Columbia Wilderness.

Table C-10 Management Acres for Lake by Alternative

Management Areas	Alternative							
	NC	A	C	E	F	H	I	Q(Pre-ferred)
A4 Special Interest Area				490	490		20	190
A5 Unroaded Recreation					590		1,270	
A6 Semi-Primitive Roaded Recreation								
A7 Special Old Growth						1,350		
A8 Northern Spotted Owl Habitat Area								790
A9 Key Site Riparian		100	100	100	110			
B2 Scenic Viewshed	370	370		180	100			30
B6 Special Emphasis Watershed					60		50	160
B9 Wildlife/Visual Area							10	
B11 Deer & Elk Summer Range								
C1 Timber Emphasis	980	880	1,260	570				180
DA1 Bull Run Drainage Watershed Management	8,320	8,320		8,310	8,320	8,320	8,320	6,900
DA2 Bull Run North Buffer- Adjacent to Wilderness	90	90	80	70	80	80	80	80
DA3 Bull Run Research Natural Area	370	370	370	390	370	370	370	
DA8 Bull Run Northern Spotted Owl Habitat Area								2,670
DC1 Bull Run South Buffer-Timber Emphasis	1,460	1,460	9,780	1,460	1,470	1,470	1,470	590

Note: Acres shown do not include all allocations for Management Requirements

Table C-11 Estimated First Decade Harvest and Roading Schedule

	Alternative							
	NC	A	C	E	F	H	I	Q(Pre-ferred)
Suitable Acres Roaded/Harvested	232	223	975	189	137	130	133	76
MMCF Harvested	1.67	1.61	7.04	1.36	1.36	0.94	0.96	0.55
Roading Cost ($MM)	0.58	0.58	0.58	0.29	0.29	0.00	0.00	0.17

Map A-5 Larch Mountain Roadless Area

Larch Mountain

Larch Mountain, 13,120 Acres

Description

History

Through the RARE I inventory process two major acreages in the Columbia Gorge were identified as unroaded, Gorge (#608) and Eagle (607). The Eagle Roadless Area met the criteria for designation as a new Wilderness Study Area. However, it was not included in the final recommendations because of the near completion of the Eagle Creek Planning Unit FEIS (1/75).

This unit plan aggregated the two RARE I areas and established management direction for some 69,200 acres. The Larch Roadless Area was classified for special interest - scenic and landscape management.

Location and Access

The Larch area is located on the Columbia Gorge Ranger District within Multnomah County. It is 30 miles east of Portland and 25 miles west of Hood River.

The northern perimeter extends from Benson State Park on Interstate 84, eastward along the Gorge to Bonneville Dam. The southern perimeter follows the Bull Run Watershed boundary.

Primary road access is via Interstate 84 and Forest Roads 15 and 1520. There is no access to the south through the Bull Run Watershed. The area is well accessed by trails including the popular Multnomah Falls Trail.

Physiography and Soils

The face of the Columbia Gorge is characterized by spectacular basalt cliffs, waterfalls and rocky outcroppings. The upper elevations are predominantly sloping ridges. The topography is steep and rugged ranging from 200 feet near Multnomah Falls to 3880 feet at Nesmith Point.

Soils on the steep north facing slopes are of igneous formation and are gravelly to cobbly gravelly loam.

Vegetation

The majority of the area is forested. Douglas-fir, western hemlock, western red cedar, red alder, and rocky mountain maple characterize the lower elevations intergrading to Pacific silver fir and noble fir at upper elevations. Understory vegetation is more diverse than at any other location on the forest, rich in both the shrub and forb components.

Current Use

General management policy (Eagle Creek FEIS, 1/75) established a special interest zone - scenic and landscape management for the unroaded area. The SIA is managed to preserve and protect the special scenic values and unique natural features.

The Larch area contains some of the most popular locations to view scenery on the Forest. Activities along the face of the Gorge include hiking, picnicking, viewing scenery, and automobile touring. Multnomah Falls receives more than 2 million visitors per year.

Surroundings and Attractions

The northern boundary of the area, the Gorge face, approaches the I-84 freeway, frontage roads, railroads, communities, and powerlines. The southern boundary is the Bull Run Watershed (closed to public entry).

Major attractions include spectacular waterfalls (Wahkena, Horsetail, and Multnomah), the Oneonta Gorge Botanical Area, Larch Mountain and Multnomah Falls Lodge (adjacent).

Capability

Manageability and Boundaries

The Larch area could be managed in an undeveloped condition. The boundaries, Bull Run Watershed to the south and roading/development to the east, north and west are logical and well defined.

Natural Integrity and Appearance

The overall development of Larch unroaded area is low. Development includes trails and recreation facilities. These features affect less than 10% of the area. Away from areas of concentrated use, the Larch area is natural appearing with ecological processes not greatly altered.

Opportunities for Solitude, Primitive Recreation and Challenge

Opportunities for solitude and primitive recreation are moderate to high with the exception of popular hiking trails. The vegetation and terrain effectively screen users from one another. Off-site intrusions are observable particularly at the lower elevation along the northern boundary.

Special Features

Adjacent to the area, and listed on the National Register of Historic Places, is the Multnomah Falls Lodge. The western end of the unroaded area contains logging camps and railroad grades left from activities of the Bridal Veil Lumbering Company, dating from the 1880's. The same area was comparatively well settled at the turn of the century and more developed improvements such as Bell's Camp, several cabins, trails, and old roads remain. Since little of the area has undergone surveys, other sites, especially prehistoric ones, probably occur in the area.

Biologically, the area is very diverse providing habitat for endemic animal and plant species such as the Larch Mountain Salamander. There are more than ten plant species currently on the Region's sensitive list found in the Columbia River Gorge.

Availability

Recreation

The Larch unroaded area provides a range of recreation opportunities. The popular trail systems are heavily used with the steep, timbered slopes largely unexplored. Estimated carrying capacity by ROS class is as follows:

ROS Class	Capacity in RVDs/Year
RN	13,285
RM	3,580
SPNM	19,835

Wildlife and Fish

The area has the capability to provide habitat for the following management indicator species: spotted owl, pine marten, pileated woodpecker, ruffed grouse and deer/elk. A wintering population of bald eagles is sometimes present along the northern boundary. At elevations below 2400 feet, the area may provide critical winter range for deer and elk.

The Columbia River Gorge is the southern limit of many northern plant and animal species and the northern limit of typically southern species. Also, the sea level passage through the Cascades allows mingling of eastern and western elements. These influences provide great habitat diversity.

The area encompasses quality fish habitat that supports populations of anadromous fish and resident trout. Fisheries objectives include maintenance and enhancement of water quality for self-sustaining fish populations and for three hatchery facilities on Tanner Creek.

Water

The area is within the Columbia River basin. Multnomah, Oneonta, Tanner, and a variety of other tributaries drain the area.

Timber

The area contains approximately 9,266 acres of land suitable for timber production. Species include Douglas-fir, western hemlock, western red cedar, noble fir, and Pacific silver fir. There is a current standing volume of 98.8 million cubic feet. The potential long run sustained yield from this area under intensive timber management would be 2.1 million cubic feet per decade.

Minerals and Energy

(H=High, M=Medium, L=Low)	
Leasable	
Lease Application Area (Acres)	
Geothermal	-
Oil and Gas	-
Resource Potential	
Geothermal	L
Oil and Gas	L
Locatable	
Number of Claims	-
Mineral Potential	L
Saleable	
Rock Materials Resource Potential	L

The potential for geothermal, oil and gas, and locatable exploration and development is low.

Fire

Fuels in the area generally are thin ground fuels with occasional areas of concentrated woody material. Fires burning in these fuels would be generally of low intensity with low spread rates. Fire suppression in the area would be an important management consideration as the potential exists for fire to spread from the Larch area into the Bull Run Watershed.

Insects and Disease

There were a few outbreaks of balsam woolly aphid identified in the area in the past. The potential is low for further damage or significant insect and disease outbreak.

Land Use

There are five parcels of private (or State) in holdings Two of the parcels will be acquired in the next year or two (20 acres in Sec. 18 of T.2N, R.6E and the State land in Section 28 of T.2N, R.6E). The owners of the remaining parcels of private land, in Sections 12, 14, and 15 of T.2N, R.6E, are not interested in exchange or sale at this time.

Need for Roadless Areas

Directly south of Larch unroaded area is the Bull Run Watershed which is closed to public entry. Nearby wilderness are: Indian Heaven, Trapper Creek, Mt. Hood, Salmon-Huckleberry and Badger Creek. In addition, there are several sizeable areas that have historically been managed as dispersed unroaded recreation: Wind Creek and Twin Lakes. The ecosystems within Larch are represented in the adjacent wilderness.

The Eagle Creek Planning Unit, a unit plan completed in 1975 analyzed public response pertinent to land allocations in the area. There was divided opinion on wilderness and Special Interest - Scenic classification.

Environmental Consequences

Table C-12 indicates the different management allocations, by alternative for the Larch unroaded area. Table C-13 presents the first decade timber harvest and roading schedule by alternative.

All alternatives maintain at least 90% of the current unroaded character of the entire area through allocation to a Scenic Area or Northern Spotted Owl Habitat Area. The Scenic Area is designed to retain the current level of development. These alternatives, therefore, maintain unroaded.

Alternatives A, NC, E, F, H, I, and Q maintain about 2% of the area in an unroaded condition through Special Interest Area or Unroaded Recreation allocations.

Alternative C allocates 230 or 2% of the area to timber emphasis the other alternatives allocated less than 1% of the area to timber harvest allocations.

Potential for Wilderness

All alternatives maintain the potential for future wilderness designation through addition to the Columbia Wilderness.

Table C-12 Management Acres for Larch by Alternative

Management Areas	Alternative							
	NC	A	C	E	F	H	I	Q(Pre-ferred)
A4 Special Interest Area		240	0	30				
A5 Unroaded Recreation	250	0	0	250	250	250	250	240
C1 Timber Emphasis			230		0	0	0	0
DB2 Bull Run North Buffer (Scenic)	10	10						
DC1 Bull Run South Buffer (Timber)	10	10	10		10	10	10	10
EA1 Scenic Area	12,240	12,200	12,220	12,170	12,200	12,200	12,200	10,920
EA4 Special Interest Area	30	30	30	30	30	30	30	30
EA8 Northern Spotted Owl Habitat Area								1,430
EA9 Key Site Riparian		50	50	50	50	50	50	50
EB2 Scenic Viewshed	580	580	580	590	580	580	580	440

Note: Acres shown do not include all allocations for Management Requirements

Table C-13 Estimated First Decade Harvest and Roading Schedule

	Alternative							
	NC	A	C	E	F	H	I	Q(Pre-ferred)
Suitable Acres Roaded/Harvested	22	22	37	21	21	21	21	16
MMCF Harvested	0.23	0.23	0.40	0.23	0.23	0.23	0.23	0.17
Roading Cost ($MM)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Map A-6 Mt. Hood Additions

Mt. Hood Additions

Mt. Hood Additions (06093), 12,940 Acres

Description

History

In 1964, the Mt. Hood Wilderness encompassed 14,100 acres. Ten years later, the RARE I process identified over 33,000 acres surrounding the wilderness as a Wilderness Study Area. These acres were included in Senate Bill S-658, addressed in the Mt. Hood Interagency Planning Unit, and added to the wilderness system through the Endangered American Wilderness Act of 1978. This made the Mt. Hood Wilderness a total of 47,160 acres.

RARE II identified and inventoried additional unroaded acres surrounding the 1978 wilderness boundary, the Mt. Hood Additions. These areas were allocated for nonwilderness uses.

Location and Access

The Mt. Hood Additions are located on the Hood River and Zigzag Ranger Districts in Clackamas and Hood River Counties. The areas are 40 miles east of Portland and 20 miles southwest of Hood River.

The additions are bounded by: Forest Roads 2639, 2645, Highway 26 and ski area development on the south; Road 2520 and Highway 35 on the east; Roads 3512, 2840, 1650 and 1810 on the north, and Roads 1828, 1825 and Lolo Pass Road (18) on the west.

Over 18 trails access the area, almost all leading through the additions into the existing wilderness. The Pacific Crest National Scenic Trail traverses about 2.5 miles of the section that forms the headwaters of White River.

Physiography and Soils

The area is contiguous with the Mt. Hood Wilderness. Topography is varied, characterized by glacial outwash plains, moderate to steep glaciated uplands and mountain slopes. Steep valley sideslopes and the deeply cut tributary of the White River are other features. Elevations range from 1,600 feet near Clark Creek to about 8,000 feet below Triangle Moraine on Mt. Hood.

Soils located on the steep east and west slopes are gravelly loam. Sandy/silt loams characterize the uplands of the northern portions of the additions. Unweathered sands, gravels and silt deposits are found in the Sandy, Zigzag and White River drainages.

Vegetation

The majority of the additions are forested with the exception of the area that forms the headwaters of White River. The southern portion of the area is comprised of western hemlock, Douglas-fir, noble fir, and Pacific silver fir. The forested land in the White River area is largely mountain hemlock, Pacific silver fir, and subalpine fir. The area east of Bluegrass Ridge is a compliment of Douglas-fir, grand fir, noble fir and some western larch. The northern and western portions of the additions are predominantly western hemlock, Pacific silver fir, noble fir, Douglas-fir and lodgepole pine. The understory species are quite varied with areas of wet and mesic forb and grass land, alpine cushion plant communities, and krumholz.

Current Use

Management direction for the majority of the additions is roaded recreation. Concentrated recreation use is associated with the three developed ski areas that are adjacent to the additions boundary.

Major activities include hiking, camping, fishing, and cross-country skiing. Recreation use for the area is influenced by the trails through the unroaded area that provide access to the wilderness.

Surrounding and Attractions

The unroaded area is bounded by road systems and, on one or more sides, by the wilderness. Three ski areas have a common boundary with the additions. They are: Timberline Lodge, Mt. Hood Meadows, and Cooper Spur. The community of Government Camp is directly south of the area.

Major attractions include parts of the White River and Newton Clark Glaciers and the White River drainage. Fairly extensive alpine meadows are found adjacent to the Mt. Hood Meadows Ski Area.

Capability

Manageability and Boundaries

All portions of the additions could be managed in an undeveloped condition in compliment with the Mt. Hood Wilderness. However, all of the areas are influenced by the sights and sounds of adjacent development. This is particularly true of the White River piece which is influenced by adjacent ski areas, and the piece east of Bluegrass Ridge influenced by Highway 35 and adjacent timber harvest activities. These potential additions do not provide more manageable boundaries for the Mt. Hood Wilderness.

Natural Integrity and Appearance

The overall development of the Mt. Hood additions is low, confined to the trail system. There is evidence of recreation use. These features affect less than 10% of the area. Natural ecological processes have not been greatly altered.

Opportunities for Solitude, Primitive Recreation and Challenge

Opportunities for solitude are low. However, vegetation and terrain create the potential for recreation challenge. Opportunities for primitive recreation are moderate.

Special Features

The additions contain portions of the Timberline Trail, built by the CCC in 1934. The west end of the area contains the Creighton Homestead of 1898 and the northeast portion contains the Harmon Homestead of 1898. Sites of prehistoric occupation are likely to exist.

There are no known sensitive plant or animal species identified in the area.

Availability

Recreation

These remaining unroaded pieces have the potential to provide a variety of recreation activities. Estimated carrying capacity by ROS class is as follows:

ROS Class	Capacity in RVDs/Year
RN	26,039
RM	14,718
SPNM	8,400
R	3,655

Wildlife and Fish

The area has the capability of providing habitat for the following management indicator species: spotted owl, pine marten, pileated woodpecker, ruffed grouse and deer/elk. The limited portions of the area less than 2400 feet in elevation have the potential of providing critical deer/elk winter range. The quality of wildlife habitat is limited by the area's high elevations, steep slopes and poor soil conditions.

A number of glacial-fed streams support populations of anadromous fish and resident trout. Fisheries objectives focus on maintenance of self-sustaining fish populations.

Water

The additions fall within three major river basins: Sandy, White River, and Hood River. Intakes for proposed hydroelectric projects occur on the Coe and Elliott branches of the Middle Fork Hood River. Others occur on the Salmon River and Devils Canyon, a tributary of the Zigzag River. The potential for additional hydroelectric exploration in this area is moderate, though the

probability of development is low. Powerlines, a key consideration in a small hydroelectric project, exist on the western boundary of the additions along the Sandy River.

Timber

The area contains approximately 7,720 acres of land suitable for timber production. Species are western hemlock, Douglas-fir, noble fir and Pacific silver fir. There is a current standing volume of 59.8 million cubic feet. The potential long run sustained yield from this area under intensive timber management would be 36.2 million cubic feet per decade.

Minerals and Energy

(H=High, M=Medium, L=Low)	
Leasable	
Lease Application Area (Acres)	
Geothermal	200
Oil and Gas	-
Resource Potential	
Geothermal	M
Oil and Gas	L
Locatable	
Number of Claims	-
Mineral Potential	L
Saleable	
Rock Materials Resource Potential	M (along White River)

The Mt. Hood area was included in a study prepared by the U. S. Geological Survey (Professional Paper 1300). Their study identified three geothermal-resource potential areas. Two of the areas fall within the eastern and western portions of the existing wilderness and the adjacent Mt. Hood Additions. The third, the Mt. Hood Known Geothermal Resource Area (KGRA), surrounds the summit and includes the upper reaches of the White River drainage. Three deep development geothermal gradient holes were drilled; two in the Old Maid Flat area and one at Timberline. The results were unsatisfactory and no development followed. The potential for continued exploration and development is moderate.

While there have been lease application areas for oil and gas near or within the additions, the potential for exploration and development is low.

The U. S. Geological Survey study recognized an area of substantiated mineral resource potential near the unroaded area: Lady Creek - Laurel Hill. However, the potential for prospecting and development is low.

There is potential for development of saleable minerals in the White River area. An active quarry currently operates in the White River area adjacent to the additions boundary.

Fire

Fuels in the area are generally thin ground fuels with occasional concentrations of heavy woody material. Fires burning in these fuels would be generally of low intensity with low rates of spread.

Insects and Disease

Isolated outbreaks of mountain pine beetle have occurred in the eastern portions of the Mt. Hood Wilderness and the adjacent additions. Small acreages of trees damaged by Douglas-fir beetles have been identified in the extreme western portions of the area. There is some evidence of spruce budworm activity. The potential is low for extensive damage or significant outbreaks of insects or disease.

Need For Roadless Areas

To the south and southeast of the Mt. Hood Additions are the Wind Creek and Twin Lakes unroaded areas. Nearby wilderness includes Columbia to the north, Salmon-Huckleberry and Badger to the southwest and southeast, respectively. The ecosystems present in the Mt. Hood unroaded east area are similar to those in the wilderness.

During the development of the Mt. Hood interagency Planning Unit, the public was involved in the process to determine land allocations for the general area. There was a desire expressed to have unroaded areas available for recreation.

Environmental Consequences

Table C-14 indicates the different management allocations, by alternative, for the Mt. Hood unroaded area. Table C-15 presents the first decade timber harvest and roading schedule by alternative. (Within the existing unroaded area boundary, there is a small portion of the permit area for the adjacent developed ski area. This is common to all alternatives.)

Alternatives F, H, and I emphasize (75% or more) maintaining the unroaded character of the area through a combination of Special Interest Area, Unroaded recreation, and Special old growth allocations.

Alternatives A, C, NC, and E emphasize timber harvest allocations, and do not protect the unroaded character.

Alternative Q maintains about 25% of the area in an unroaded condition.

Potential for Wilderness

Alternatives F, H, and I maintain the opportunity to add acreage to the Mt. Hood Wilderness in the future. Alternatives A, C, NC, E, and Q do not maintain the opportunity for future addition to the wilderness system.

Table C-14 Management Acres for Mt. Hood Additions by Alternative

Management Areas	Alternative							
	NC	A	C	E	F	H	I	Q(Pre-ferred)
A4 Special Interest Area	0	0	0	270	1,550	1,350	1,350	1,210
A5 Unroaded Recreation	0	0	0	0	9,790	2,070	10,880	760
A7 Special Old Growth						7,110		
A8 Northern Spotted Owl Habitat Area								2,330
A9 Key Site Riparian			50	50		50	50	50
A10 Developed Rec. Ski Areas			40		40	40	40	40
A11 All Winter Recreational Areas	830	830	840	910	740	770	80	2,070
B1 Wild/Scenic/Recreational Rivers	1,980	1,980	1,980	910	740	770	80	2,070
B2 Scenic Viewshed	6,260	6,460	0	5,630	430	50	0	2,570
B6 Special Emphasis Watershed							10	350
B9 Wildlife/Visual Area	0	0	0	750	0	0	130	740
B10 Winter Range							180	
B11 Deer & Elk Summer Range							60	
C1 Timber Emphasis	3,870	3,670	10,030	3,360	100	70	0	1,320

Note: Acres shown do not include all allocations for Management Requirements

Table C-15 Estimated Decade Harvest and Roading Schedule

	Alternative							
	NC	A	C	E	F	H	I	Q(Pre-ferred)
Suitable Acres Roaded/Harvested	477	471	657	450	26	48	17	233
MMCF Harvested	3.69	3.65	5.09	3.48	0.20	0.37	0.13	1.80
Roading Cost ($MM)	0.90	0.90	0.90	0.90	0.14	0.14	0.00	0.59

Map A-7 Olallie/Mt. Jefferson Roadless Area

Olallie/Mt. Jefferson

Olallie (06099) / Mt. Jefferson (06101), 7770 Acres

Description

History

The Olallie area was studied during both the RARE I and RARE II processes. It was not included in the final list of candidate Wilderness Study Areas by RARE I. RARE II allocated the area to further planning. As a result, a Forest level environmental analysis report was developed in 1983 displaying a variety of management alternatives. These alternatives will be analyzed within the framework of the Mt. Hood Forest Plan.

Location and Access

The Olallie area is located on the Clackamas Ranger District within Marion and Jefferson Counties. It is 85 miles southeast of Portland and 70 miles northeast of Salem.

The area is bounded on the north by the BPA McNary - Santiam Powerline and on the east and west by Forest Road 4220 (with a small exception west of 4220 and east of State Highway 46: the Mt. Jefferson addition).

Over 44 miles of interconnecting trails traverse the area including 8-1/2 miles of the Pacific Crest National Scenic Trail.

Physiography and Soils

The area is mostly gently rolling plateau land with lake filled depressions. Cone-shaped buttes and peaks dot the terrain. The north half is a gentle glacial outwash area while the southern portion is characterized by rock cliffs and talus slopes. The Mt. Jefferson addition is a steep, southwest facing slope. Elevation ranges from 2800 feet near the Breitenbush River to 5998 feet at the top of Double Peaks.

The unroaded area is covered with glacial till. It ranges from a thin veneer on ridges and sideslopes to greater depths in morainal deposits and depressions. Soil textures range from sandy loam to a fine sandy loam. Stones, cobbles, and gravels make up 50% or more of the soil volume. The soil structure is weak and offers little resistance to erosion.

Vegetation

The majority of the area is forested. Major tree species include noble fir, Pacific silver fir, mountain hemlock and lodgepole pine. The understory is comprised of huckleberry, including grouse huckleberry, bear grass, and a variety of other shrubs, forbs, and sedges. The volcanic history of the area has produced an extensive system of wetlands (lakes and meadows).

Current Use

The area has long been managed as the Olallie Lake Scenic Area, noted for its high elevation forests, lakes, and meadows. Major use of the area is recreation. Activities include fishing, camping, hunting, berry picking hiking, photography and snowmobiling. Recreation use totals 106,000 RVDs, with over 70% of the use occurring at the lakes.

Surroundings and Attractions

The area is bordered on the north by general forest land and on the south, southwest by the Mt. Jefferson Wilderness. To the east is a portion of the Olallie Special Interest area. The Warm Springs Indian Reservation is also east of the unroaded area and is managed to protect recreation values.

The Olallie area is a high elevation plateau with many lakes, numerous small ponds, and hundreds of meadows and wetlands. Several outstanding cinder cones and unique geologic landforms add scenic value and provide viewpoints of the surrounding area and Mt. Jefferson. Adjacent to the eastern boundary of the unroaded area is the popular Olallie Lake and resort.

Capability

Manageability and Boundaries

The powerline to the north and Road 4220 form logical boundaries and are adequate to manage the unroaded area in an undeveloped condition. The topography and vegetation combine to screen the visitor from the sights and sounds of development along the eastern boundary. The present road system provides adequate access for both management activities and a variety of recreation uses.

Natural Integrity and Appearance

The overall development of Olallie is low away from the developed recreation sites and low standard Skyline

Road (4220). Development within, or adjacent to, the area includes campgrounds, a picnic ground, boat ramps, and a small resort store with cabins. Other features include trails, roads, evidence of recreation use, and administrative cabins. These features affect less than 10% of the area. Thus, visitors find the unroaded area natural in appearance with developments present perceived to not affect the natural ecological processes of the area.

Opportunities for Solitude, Primitive Recreation and Challenge

Opportunities for solitude and primitive recreation, in the Olallie area, are moderate. The topography and vegetation provide a level of screening of users from one another. Diversity in terrain, vegetation, water resources, and fish and wildlife provide some potential for primitive recreation.

Special Features

Although at high elevations, the area has the potential for prehistoric sites. At present, several sites have been inventoried.

There are no known sensitive plan or animal species found in the area.

Availability

Recreation

The Olallie unroaded area has historically provided a variety of unroaded types of recreation activities. Estimated carrying capacity by ROS class is as follows:

ROS Class	Capacity in RVDs/Year
RN	11,955
RM	129
SPNM	7,885
SPM	2,650

Wildlife and Fish

Extensive lodgepole stands in the area provide optimum habitat for black-backed and three-toed woodpeckers and potentially the great gray owl. The area also has the capability of providing habitat for the following management indicator species: pine marten, pileated woodpecker, ruffed grouse, spotted owl and deer/elk.

The entire area is devoted to trout production with high recreation use. Fisheries objectives focus on habitat quality for wild and introduced trout populations.

Livestock

Current use of the area is by recreation stock only, though domestic use occurred in the past. Available forage is concentrated in scattered meadows and undergrowth in the lodgepole pine stands.

Timber

The area contains approximately 2,190 acres of land suitable for timber production. Species are noble fir, Pacific silver fir, mountain hemlock, and lodgepole pine. There is a current standing volume of 14.5 million cubic feet. The potential long run sustained yield from this area under intensive timber management would be 0.6 million cubic feet per decade.

Minerals and Energy

(H=High, M=Medium, L=Low)	
Leasable	
Lease Application Area (Acres)	
Geothermal	-
Oil and Gas	-
Resource Potential	
Geothermal	M
Oil and Gas	L
Locatable	
Number of Claims	-
Mineral Potential	L
Saleable	
Rock Materials Resource Potential	M

The "Geothermal Leasing - Clackamas Area - Environmental Assessment Report (3/81)" analyzed existing lease applications near the Olallie unroaded area. The results of this document, the proximity of Olallie to the Breitenbush Known Geothermal Resource Area (KGRA), and the recent drilling of a thermo gradient well adjacent to the area indicate a moderate potential for geothermal exploration and development.

The Olallie area was included in a study prepared by the U. S. Geological Survey (Professional Paper 1300).

Their results indicate no evidence of fossil fuels which suggests a low rating for oil and gas exploration and development.

The U.S. Geological Survey study also states the area is devoid of mines and mineral prospects. There are no existing claims and the potential for exploration and development is, subsequently, rated low.

Rock material for activities such as road building is available in the area (U.S. Geological Survey study). However, similar material is abundant in accessible, nearby areas.

Fire

Fuel loadings in the area is predominately sparse undergrowth with a thin layer of ground fuels. Fires burning in these fuels would burn with low intensity and low rates of spread where down woody material is concentrated.

Insects and Disease

A few isolated areas of mountain pine beetle have been identified in the unroaded area as well as some evidence of spruce budworm. The potential is low for further damage or significant outbreaks of insects or disease.

Need For Roadless Areas

Directly south of the Olallie area is the Mt. Jefferson Wilderness. The Bull of the Woods Wilderness is to the west. The Olallie unroaded area provides a less rigorous, unroaded experience available for day use by individuals of varying backcountry abilities. There are unique geologic landforms and scenic qualities associated with this area.

A public involvement process was begun during formulation of the Clackamas Unit Plan (1977). The Unit Plan was discontinued in 1980 with the beginning of the current Forest planning. Public sentiment suggested that the area continue to be managed for its scenic and recreational qualities.

Environmental Consequences

Table C-16 indicates the different management allocations, by alternative, for the Olallie unroaded area. Table C-17 presents the first decade timber harvest and roading schedule by alternative.

Alternative H proposes to manage 99% of the area as dispersed unroaded recreation. As required in the RARE II process, Olallie is considered for wilderness management in Alternative I. Both of these allocations will maintain the unroaded character of the area and, in Alternative F, allow for future classification as a wilderness.

Alternatives A, NC, E, F, and Q also retain at least 94% of the unroaded character of the area by allocation to a special interest area (SIA). (Alternative A and NC propose timber harvest of 2% of the area.

Alternative C allocates 97% of the area to timber emphasis; therefore, eliminating the unroaded character.

Alternatives A, C, NC, and E also allocate about 3% of the area to the wild and Scenic River allocation.

Potential for Wilderness

All alternatives except C maintain the opportunity for future wilderness designation through addition to the Mt. Jefferson Wilderness. Alternative C eliminate the future option of wilderness designation.

Table C-16 Management Acres for Olallie/Mt. Jefferson by Alternative

Management Areas	Alternative							
	NC	A	C	E	F	H	I	Q(Preferred)
A2 Wilderness	0	0	0	0	0	0	7,670	
A4 Special Interest Area	7,340	7,340	0	7,490	7,770	100	100	7,470
A5 Unroaded Recreation	0	0	0	0	0	7,670	0	
A8 Northern Spotted Owl Habitat Area								300
B1 Wild/Scenic/Recreational Rivers	260	260	260	280				
C1 Timber Emphasis	170	170	170	0	0	0	0	

Note: Acres shown do not include all allocations for Management Requirements

Table C-17 Estimated Decade Harvest and Roading Schedule

	Alternative							
	NC	A	C	E	F	H	I	Q(Preferred)
Suitable Acres Roaded/Harvested	8	8	215	4	0	0	0	0
MMCF Harvested	0.06	0.06	1.43	0.03	0.00	0.00	0.00	0.00
Roading Cost ($MM)	0.00	0.00	1.98	0.00	0.00	0.00	0.00	0.00

Map A-8 Roaring River Roadless Area

Roaring River

Roaring River, 27,250 Acres

Description

History

The Roaring River unroaded area was inventoried through the RARE I process. The majority of the area was allocated to a special interest scenic zone with a small amount proposed for landscape management in the Roaring River Unit and Salmon River Unit Land Use Plan (FEIS, 10/74).

Location and Access

The Roaring River area is located on the Estacada and Clackamas Ranger Districts in Clackamas County. It is 30 miles southeast of Portland and 15 miles southeast of Estacada.

The area is accessible on the north by the Abbott Road (4610) and a small portion on the south by State Highway 224. The western boundary is roughly Lookout Springs, Huxley Lake, and the mouth of the Roaring River. Forest Road 4635, Mt. Mitchell, Road 5830, Road 5830-240, and High Rock make up the southern and eastern boundaries. The primitive Indian Ridge Road penetrates the area approximately in the center, in an east-west orientation. The road is not included in the inventoried unroaded area; however, it is permanently closed.

Fifty-two miles of trails access the area, including the popular Rock Lakes Basin Trail system.

Physiography and Soils

The Roaring River area is dominated by a steep river drainage flowing in a southwesterly direction to the Clackamas River. Smaller side drainages dissect the area and include Cougar Creek, Splintercat Creek, Squaw Creek, and the South Fork of the Roaring River. The lower section of the Roaring River is a spectacular narrow gorge, lined with basalt cliffs and talus slopes. Further upstream the canyon widens to steep, heavily-timbered slopes. Beyond the river corridor, the area is characterized by several dominant ridges as well as a series of upper elevation lakes. Elevation ranges from 990 feet near the confluence of the Roaring and Clackamas Rivers to 5195 feet at Signal Buttes.

Shallow, stony soils with a high erosion potential occur on the steepest sections of the Roaring River drainage. Stony loams are prominent in the southeastern arm of the area and along the upper reaches of the Roaring River. Gravelly silt loams and sandy silt loams are found on moderate to steep sideslopes throughout the area. Rock outcroppings and talus slopes are significant features throughout.

Vegetation

The majority of the Roaring River area is forested. Douglas fir, western red cedar, and red alder dominate the river and tributary bottoms. The lower elevation slopes are largely Douglas fir and western hemlock, intergrading to mountain hemlock, Pacific silver fir and noble fir at upper elevations. There are small amounts of Engelmann spruce and western white pine. The understory is typical of Western Oregon, comprised of rhododendron, huckleberry, beargrass and other shrubs and forbs. The ridges are relatively open with some coniferous trees and hardwood shrub species as well as rock fields. The large area between the Serene Lakes Basin and Mt. Mitchell contains wet meadows.

Current Use

General management policy (Roaring River/Salmon River FEIS, 10/74) established a Special Interest Zone - Scenic for the majority of the Roaring River unroaded area. This zone is managed to preserve and protect special scenic values and unique natural features.

Primitive and semi-primitive recreation opportunities exist in the central portion of the area. Access into this area is limited so most recreation use occurs on the roaded periphery and in the Rock Lakes Basin. Major uses include hiking, camping, fishing, huckleberry picking and cross-country skiing. Total recreation use is estimated at 13,900 RVDs.

A small portion of the western edge of the unroaded area is in a grazing allotment. There is very little use associated with this portion of the permit area.

Surroundings and Attractions

The Roaring River unroaded area includes the entire Roaring River drainage, and the Cache Meadow/Cripple Creek areas to the south. The area is bounded on the north by the Salmon-Huckleberry Wilderness. The western, eastern, and southern boundaries are forest roads and lands managed for timber emphasis.

Primary attractions of the area are water related: the Rock Lakes Basin, Cache Meadows, Shining Lake, and

Roaring River. The dominant ridges afford excellent views of the entire area and other Cascade mountain peaks. Another attraction of the area is its rugged and inaccessible character.

Capability

Manageability and Boundaries

The present boundaries are adequate to manage the unroaded area in an undeveloped condition. While roads define the perimeter of the area, terrain limits both access and the sights and sounds associated with a greater level of development. Gating the road access to the southwestern boundary (Road 4636)

would reduce potential conflict with other development oriented uses. The present road system provides a variety of access points and adequate parking for day and overnight use.

Natural Integrity and Appearance

The overall development of Roaring River unroaded area is low. Development includes trails, minor recreation facilities at Serene Lake, a shelter at Cache Meadow, and past timber harvesting. There is evidence of recreation use. These features affect less than 10% of the area. Natural ecological processes have not been greatly altered.

Opportunities for Solitude, Primitive Recreation and Challenge

The opportunity for solitude is high all year. The area, exclusive of Serene Lake, Rock Lakes Basin, and Cache Meadows, is rugged and has limited access. Travel into the upper reaches of the Roaring River drainage would be physically demanding and provide opportunities for recreation in a primitive setting.

Special Features

There are several cultural resource sites within the area. The Cache Meadow Trail Shelter, built around 1910, is located within the unroaded area. It remains in excellent condition due to voluntary maintenance done by Ranger District personnel. Also, lookouts were once located at Grouse Point, Mt. Mitchell, and Indian Ridge.

One site with Indian religious significance used for spirit questing has been located. Other prehistoric occupation sites may exist. A traditional huckleberry gathering area is located near the northwestern boundary of the unroaded area.

There are no known sensitive plant or animal species identified in the area.

Availability

Recreation

In the current undeveloped condition, Roaring River has the potential to provide a variety of unroaded types of recreation activities. It is one of the only areas outside of wilderness that has been inventoried as providing a primitive recreational experience. Estimated carrying capacity by ROS class:

ROS Class	Capacity in RVDs/Year
RN	11,440
RM	17,196
SPNM	27,500
P	8,191

Wildlife and Fish

The area has the capability of providing habitat for the following management indicator species: spotted owl, pine marten, ruffed grouse, pileated woodpecker and deer/elk. High quality wildlife habitat is limited by high elevations, steep slopes, and poor soil conditions.

Of all the unroaded areas, Roaring River provides some of the highest quality fisheries habitat. The lower three miles of Roaring River is a major production and holding area for spring Chinook, steelhead, and possibly coho salmon. Management of the area for primitive recreation would be compatible with fisheries objectives concerning fishing pressure, harassment, water quality, tributary shading and overall habitat quality.

Water

The study area lies in the Clackamas basin, primarily encompassing the Roaring River drainage. Two small hydroelectric projects have been proposed on Roaring River. Two others are proposed on an unnamed tributary of the river near its confluence with the Clackamas. There are also proposed hydroelectric projects on several creeks just outside the unroaded area boundary. They include: Dinner Creek, Three Lynx Creek, Cripple Creek, and Canyon Creek. The potential for further

exploration and development in the area is moderate. Powerlines, a key consideration in small hydro developments, follow Highway 224 along the area's southwest boundary.

Livestock

The western portion of the area falls within the Roaring River Cattle Allotment. Current domestic use in this small portion is minimal. The potential of the area for forage production is estimated at 10 AUM's.

Timber

The area contains approximately 11,729 acres of land suitable for timber production. Species are Douglas-fir, western red cedar, hemlock, Pacific silver fir, and noble fir. There is a current standing volume of 110.6 million cubic feet. The potential long run sustained yield from this area under intensive timber management would be 26.4 million cubic feet per decade.

Minerals and Energy

(H=High, M=Medium, L=Low)	
Leasable	
Lease Application Area (Acres)	
Geothermal	-
Oil and Gas	5640
Resource Potential	
Geothermal	M
Oil and Gas	L
Locatable	
Number of Claims	-
Mineral Potential	L
Saleable	
Rock Materials Resource Potential	L

The potential for geothermal exploration and development is low. There are lease applications available for oil and gas exploration and development. The area has moderate potential for oil and gas recovery but present economic conditions make exploration and development unlikely.

The area does have evidence of locatable mining activity. There are no active claims.

A mercury claim is located on the Oak Grove Fork of the Clackamas River close to the unroaded area's southern boundary. It is the only patented claim on the Forest. The mine has been closed for a number of years, but there is some renewed interest in working and developing the mine. The potential for exploration and development within the unroaded area is, however, low.

Two active quarries currently exist adjacent to the eastern and southwestern boundaries. The potential for development of saleable rock material is low.

Fire

Past fire history indicates stand rotation fire frequency of 250-350 years with low intensity fire frequency of 75 to 125 years. Fuel loadings in the area are predominantly sparse undergrowth with a thin layer of ground fuels. Scattered areas of heavy concentrations of large and small downed materials also occur. Fires burning in these fuels would burn with low intensity and low rates of spread except where down woody material is concentrated.

Insects and Disease

There is evidence of spruce budworm scattered throughout the area. The potential is low for extensive damage or significant outbreaks of insects or disease.

Need for Roadless Areas

Directly north of the Roaring River unroaded area is the Salmon Huckleberry Wilderness. The ecosystems within Roaring River are represented in the adjacent wilderness. The unroaded area does, however, provide for a primitive recreational experience outside of designated wilderness.

The area was not included in the RARE II inventory as a unit plan had been completed. Public response in the unit plan and during the formulation of alternatives for this plan supported special interest classification for the area to maintain scenic and recreation values.

Environmental Consequences

Table C-18 indicates the different management allocations, by alternative, for the Roaring River unroaded area. Table C-19 presents the first decade timber harvest and roading schedule by alternative.

Alternatives H and I maintain 97% - 100% of the unroaded character of the area through a combination of allocations to Special Interest Area (SIA), unroaded recreation, special old growth, and wild Scenic and Recreational River. These two alternatives, therefore, will maintain unroaded qualities.

Alternatives E, Q, and F maintain 79% - 89% of the unroaded character through a combination of SIA, unroaded recreation, wild, scenic, and Recreational River, and Northern Spotted Owl Habitat Area allocations. These alternatives would maintain the vast majority of the area for future wilderness.

Alternatives A and NC maintain about 70% of the area's unroaded character through a combination of SIA and wild scenic, and Recreational River allocations.

Alternative C makes 83% of the area available for timber harvest, while alternatives A and NC make about 28% of the area available for timber harvest.

Potential for Wilderness

Alternatives H, I, E, Q, and F maintain the opportunity for future wilderness designation through addition to the Salmon-Huckleberry Wilderness. Alternatives A and NC maintain portions of the roadless area that could be added to wilderness in the future. Alternative C eliminates the potential for future wilderness designation.

Table C-18 Management Acres for Roaring River by Alternative

Management Areas	Alternative							
	NC	A	C	E	F	H	I	Q(Preferred)
A4 Special Interest Areas	14,920	14,660	0	16,890	17,260	17,290	17,380	10,530
A5 Unroaded Recreation	0	0	0	0	2,430		4,340	
A6 Semi-Primitive Roaded Recreation				1,550	2,150		460	2,100
A7 Special Old Growth						9,960	10	
A8 Northern Spotted Owl Habitat Areas								9,240
A9 Keysite Riparian		140	260	580	120			140
B1 Wild/Scenic/Recreational River	4,560	4,780	4,620	4,620	4,630	0	4,630	2,560
B2 Scenic Viewshed	5,930	5,830	0	390	440	0	0	880
B3 Roaded Recreation					210			210
B10 Winter Range							110	
B11 Deer & Elk Summer Range							320	
C1 Timber Emphasis	1,840	1,840	22,370	3,220	10	0	0	1,590

Note: Acres shown do not include all allocations for Management Requirements

Table C-19 Estimated Decade Harvest and Roading Schedule

	Alternative							
	NC	A	C	E	F	H	I	Q(Preferred)
Suitable Acres Roaded/Harvested	305	308	1,062	246	114	0	109	147
MMCF Harvested	2.88	2.90	10.02	2.32	1.08	0.00	1.03	1.39
Roading Cost ($MM)	3.78	3.78	10.10	2.27	1.26	0.00	0.00	2.27

Map A-9 Salmon-Huckleberry Roadless Area

Salmon-Huckleberry

Salmon-Huckleberry (06095),17,650 Acres

Description

History

The Salmon-Huckleberry area was inventoried as part of the RARE I process but was not included in the final list of candidate Wilderness Study Areas. It was studied under three separate Forest Service Unit plans: Roaring River/Salmon River, Huckleberry, and Mt. Hood Interagency. Final environmental statements were issued in 1974, 1975 and 1977, respectively. These documents proposed unroaded and roaded recreation, landscape, and multiple use management for the area.

Public interest in the Salmon-Huckleberry area prompted consideration in the RARE II process even though completed unit plans prescribed management for the area. Through the RARE II process, 8300 acres were allocated for wilderness and 60,500 acres allocated to nonwilderness.

Over eight thousand acres of the Salmon-Huckleberry area were included in the Oregon Wilderness Bill of 1979 (S-2031) and 53,000 acres in the Oregon Wilderness Bill of 1983 (HR-1149). The majority of the area (44,800 acres) became wilderness under the Oregon Wilderness Act of 1984.

Location and Access

The Salmon-Huckleberry area is located on the Estacada and Zigzag Ranger Districts in Clackamas County. There are five separate pieces that remain after the passage of the Oregon Wilderness Act. Piece A lies east of Hunchback Mountain (Trail 793) and north of Road 2613 bounded by the Still Creek Road (2612) to the north. A second piece, (B), is comprised of the area south of Fir Tree Campground bounded by the road to Linney Creek (5800240) on the south, and an area south and west of Linney Creek campground to Linney Butte. The third piece, (C), is a small area at the end of the Salmon River Road (2618). The fourth piece, (D), is the headwaters of the North Fork of the Clackamas River southwest of the Old Baldy Trail (502). This piece includes the Squaw Lakes area. The final piece, (E), is west of the Wildcat Mountain (782), and Old Baldy (502) Trails bounded by roads or the Forest boundary.

Primary access to the five areas includes: Highway 26 and Still Creek Road; Road 5800240 and 4610; Road 2618; Road 4610; and Roads 3626 and 4614, respectively. Generally, the unroaded areas are 30 miles from Portland and accessed by trail systems.

Physiography and Soils

The portion east of the Hunchback Ridge, (piece A), is a steep, northeast facing slope. The area is very dissected by drainages including Cool Creek. Elevation ranges from 2000 feet to 5000 feet near Devil's Peak. Piece B is more moderate terrain comprised of a south facing slope to the Salmon River and a broad bench above the Salmon to the south. The Linney Butte portion is a southwest-northeast ridge. Elevation ranges from 2800 feet to approximately 4800 feet. The piece at the end of the Salmon River Road, Piece C, is varied topography, approximately 1800 feet in elevation. Piece D forms the headwaters of the North Fork of the Clackamas River and also includes Squaw Lakes. Elevation ranges from 3600 feet to 4771 feet at Squaw Mountain. The final piece, (E), is west to northwest facing slopes including portions of the Eagle Creek drainage. Elevation ranges from 2400 feet to 4209 feet at Old Baldy.

Generally, soils are classified as cobbly to gravelly loams. On the steeper, dissected slopes, landslide hazards exist.

Vegetation

Vegetation is varied for the five areas. At the lower elevations, tree species are predominantly Douglas-fir, western hemlock, with some western red cedar. Red alder is common at lower elevations such as the end of the Salmon River road. Noble fir and Pacific silver fir are found at higher elevations. The area south of Fir Tree Campground has a lodgepole pine, western white pine component. Shrub species include huckleberry, rhododendron, salal, salmonberry, chinkapin and oceanspray. Beargrass is common, particularly along drier ridgetops and benches. The Squaw Lakes area is a wet meadow ecosystem. There are thin soiled rocky outcrops throughout all areas that support high elevation grass/forb communities.

Current Use

Management direction for the area is included in the following unit plans:

Mt. Hood Planning Unit

8,100 acres of the area between Still Creek and Hunchback - Kinzel Lake were designated roaded recreation in the final environmental statement issued November 1977. This is a portion of piece A.

Roaring River/Salmon River Unit Plan

Portions of the remaining unroaded areas are covered by this final environmental statement (10/74). Piece B was allocated to landscape management and general forest. Piece C was allocated to landscape management and the Squaw Lake area, of piece D, was allocated to a special interest area - geologic.

Recreation opportunities include semi-primitive experiences in a near natural unroaded condition. Dispersed recreation opportunities are also available that have reasonable access to road systems. The primary use of the area includes hiking, fishing, hunting, berry picking and cross country skiing. Each of the remaining unroaded pieces have trail and nearby road access.

Surrounding and Attractions

Each of the remaining unroaded pieces is bounded on one or more sides by the Salmon-Huckleberry Wilderness. The other boundaries are forest roads and lands managed for timber emphasis.

Primary attractions are the dominant ridges that afford excellent views of the entire area and other Cascade Mountain peaks. The Squaw Lakes and Veda Lake areas are local attractions, along with the Salmon River.

Capability

Manageability and Boundaries

Each of the five areas could be managed in an undeveloped condition in compliment with the Salmon-Huckleberry Wilderness. These areas are largely the unroaded slopes remaining outside of the ridgeline wilderness boundary and would not, therefore, provide a more manageable wilderness boundary. The Hunchback Mountain area is the only sizeable unroaded piece that would be logical to manage independently of the wilderness.

Natural Integrity and Appearance

The overall development of the Salmon-Huckleberry unroaded area is low confined to the trail system. There is evidence of recreation use. These features affect less than 10% of the area. Natural ecological processes have not been greatly altered.

Opportunities for Solitude, Primitive Recreation and Challenge

The opportunity for solitude is moderate. The dense shrub layer has a tendency to concentrate use. Off-site intrusions include roads, timber harvesting and community development. Travel off of the trail system would be physically demanding but not within a primitive setting.

Special Features

The area contains old fire system trails dating to the 1920's. The Salmon River Trail (not the present recreation trail) was built of puncheon in 1925 and is still in good condition. The Squaw Lakes area was popular for huckleberry picking. Two prehistoric sites have been found nearby and others may exist.

Sensitive plants in the area include Corydalis aquaegelidae, Draba aureola, and Lycopodium selago.

Availability

Recreation

These remaining unroaded pieces have the potential to provide a variety of recreation activities. Estimated carrying capacity by ROS class is as follows:

ROS Class	Capacity in RVDs/Year
RN	32,250
RM	20,540
SPNM	9,280
SPM	637

Wildlife and Fish

The area has the capability to provide wildlife habitat for the following management indicator species: spotted owl, pine marten, ruffed grouse, pileated woodpecker, and deer/elk. The lower elevations, below 2400 feet, have the potential of providing critical winter range for deer/elk.

The Salmon-Huckleberry unroaded area provides high quality fisheries habitat. The lower 11 miles of the Salmon River and Still Creek supports major runs of anadromous fish. Fisheries objectives include maintenance of self-sustaining fish populations and high water quality (temperature, sediment) for downstream hatchery production.

Water

Tributaries and streams on the east side of Hunchback Mountain, Piece A, flow east to Still Creek and the Zigzag River drainage. The tributaries in Piece B drain into the upper reaches of the Salmon River as does Piece C located at the end of the Salmon River Road (2618). Piece D forms the headwaters of the North Fork of the Clackamas River. The area to the west of Wildcat Mountain (Piece E) drains into the Sandy river while the area west of Old Baldy drains into Eagle Creek and the Clackamas River. Two small hydroelectric proposals exist in Eagle Creek and South Fork Eagle Creek. The potential for further hydroelectric exploration is moderate though the probability of development is low.

Timber

The area contains approximately 14,628 acres of land suitable for timber production. Species are Douglas-fir, western hemlock, western red cedar, noble fir, and Pacific silver fir. There is a current standing volume of 134.6 million cubic feet. The potential long run sustained yield from this area under intensive timber management would be 82.6 million cubic feet per decade.

Minerals and Energy

(H=High, M=Medium, L=Low)	
Leasable	
Lease Application Area (Acres)	
Geothermal	-
Oil and Gas	-
Resource Potential	
Geothermal	L
Oil and Gas	L
Locatable	
Number of Claims	0
Mineral Potential	L
Saleable	
Rock Materials Resource Potential	L

While there have been some lease application areas for geothermal adjacent to the remaining unroaded areas, the potential for exploration and development of both geothermal and oil and gas resources is low. There is also low potential for metallic mineral deposits in the area.

Fire

Fuels in the area are predominately thin ground fuels. There are intrusions of concentrated large fuels and concentrated fuels less than 3 inches in diameter. Fires burning in the area would generally be of low intensity and spread except in the areas of heavy fuel concentration.

Insects and Disease

A few isolated areas of balsam woolly aphid have been mapped in the unroaded area. There is some evidence of spruce budworm activity. The potential is low for further damage or significant outbreaks of insects and disease.

Need For Roadless Areas

All of the remaining unroaded pieces have one or more boundaries along the Salmon-Huckleberry Wilderness. There are several other wilderness areas nearby: to the north is Mt. Hood and Columbia; to the east is Badger

Creek. On the north side of the Still Creek Road (2612) is the Wind Creek unroaded area. Other nearby areas that have historically been managed in an unroaded condition are Twin Lakes and Roaring River to the east and south, respectively. The ecosystems present in the Salmon-Huckleberry unroaded area are similar to those in the Salmon-Huckleberry wilderness.

The public involvement process during RARE II and development of the Roaring River-Salmon River Unit Plan indicated interest in ensuring primitive recreation opportunities. This interest was for the large unroaded area that existed before the passage of the Oregon Wilderness Act. The remaining unroaded pieces have had continued public support for management in an undeveloped condition.

Environmental Consequences

Table C-20 indicates the different management allocations, by alternative, for the Salmon-Huckleberry unroaded area. Table C-21 presents the first decade timber harvest and roading schedule by alternative.

Alternatives F, H, and I maintain 93% - 97% of the unroaded character of the area through a combination of Special Interest Area (SIA), Special Old Growth, and unroaded recreation allocations. These alternatives would maintain unroaded qualities.

Alternatives A, C, E, NC, and Q maintain 25% or less of the unroaded character of the area. Alternatives A, C, and NC 97% - 99% of the area available for timber harvest. These alternatives would not maintain the unroaded qualities.

Potential for Wilderness

Alternatives F, H, and I maintain the opportunity for future wilderness designation through addition to the Salmon-Huckleberry Wilderness. Alternatives A, C, NC, E, and Q would eliminate the potential for future wilderness designation.

Table C-20 Management Acres for Salmon-Huckleberry by Alternative

Management Areas	Alternative							
	NC	A	C	E	F	H	I	Q(Preferred)
A4 Special Interest Area	440	380	0	310	400	0	400	400
A5 *Unroaded Recreation*	0	0	0	3,420	16,300	10	15,830	2,590
A6 Semi-Primitive Roaded Recreation				10	10		10	10
A7 Special Old Growth						17,180	20	
A8 Northern Spotted Owl Habitat								1,510
A9 Keysite Riparian	120	120		190	120	120	120	120
B1 Wild/Scenic/Recreational River	600	580	600	570	80	90	110	500
B2 Scenic Viewsheds	9,860	0	9,930	350	330	50	0	2,600
B3 Roaded Recreation	0	0	0	520	360	0	0	960
B6 Special Emphasis Watersheds	0	0	0	4,600	20	0	0	6,180
B9 Wildlife/Visual Areas							580	
B10 Winter Range							210	70
B11 Deer & Elk Summer Range							3170	
B12 Backcountry Lakes					20			170
C1 Timber Emphasis	6,690	16,950	6,680	7,680	10	200	0	2,540

Note: Acres shown do not include allocations for Minimum Management Requirements

Table C-21 Estimated First Decade Harvest and Roading Schedule

	Alternative							
	NC	A	C	E	F	H	I	Q(Preferred)
Suitable Acres Roaded/Harvested	990	988	1,429	887	34	22	53	645
MMCF Harvested	9.11	9.10	13.15	8.16	0.32	0.21	0.48	5.93
Roading Cost ($MM)	1.44	1.44	1.44	1.16	0.29	0.29	0.00	1.16

Map A-10 Twin Lakes Roadless Area

Twin Lakes

Twin Lakes (06096), 6090 Acres

Description

History

The Twin Lakes area was initially inventoried through the RARE I process and was not recommended as a Wilderness Study Area. In the final environmental statement of the RARE II process, the unit was allocated to non-wilderness. As part of RARE II, it was included in the release language of the RARE II Review Act of 1981, S-842.

Location and Access

The area is located on the Bear Springs Ranger District within Clackamas, Hood River and Wasco Counties. It is 60 miles southeast of Portland and 35 miles south of Hood River. It is roughly bounded by U.S. Highway 26 to the west, Buzzard Point to the north, Barlow Road (3530) to the east, and Frog Lake Buttes to the south.

Trailhead access includes Barlow Pass and Wapinita Pass/Frog Lake. Five miles of the Pacific Crest National Scenic Trail and the Twin Lakes trail system are available for horse and hiker use.

Physiography and Soils

The area encompasses both steep mountain slopes and a plateau atop gentler sloping ridges. Dominant ridges surround two high elevation lakes, the Twin Lakes, formed in glaciated cirques. Other smaller lakes in the area include Green and Catalpa Lakes. Elevations range from 3200 feet near Barlow Creek to the Cascade Crest at 4,925 feet.

Almost the entire Twin Lakes area is composed of sandy and silt loams. The steep glaciated sideslopes exhibit potentials for surface soil damage and erosion.

Vegetation

The majority of the area is densely forested. Major species include Douglas-fir, noble fir, Pacific silver fir, mountain hemlock, Engelmann spruce, western white pine and lodgepole pine. The understory is diverse, comprised of huckleberry, rhododendron, beargrass and a variety of other shrubs and forbs. There are also a number of wet meadows. Scattered throughout, and particularly associated with major peaks, are barren or sparsely vegetated talus openings.

Current Use

Management direction for the area is general forest. Areas along Highway 26 and Barlow Road are managed to emphasize the visual resource. Recreation opportunities occur in a natural environment but within easy access of road and trail systems.

Major activities include hiking, cross country skiing, camping, and fishing. Total recreation use within the area is 8,000 RVDs, the majority occuring at Twin Lakes. Heavy year-round use directly outside the perimeter (26,500 RVDs) occurs at Frog Lake and along the Barlow Road corridor.

The area is within the White River Cattle Allotment, though grazing use is minimal.

Surroundings and Attractions

The Twin Lakes area is bounded on the west by Highway 26. Frog Lake, a popular year-round recreation site is near the southwest corner. The historic Barlow Road is adjacent to the eastern boundary and forest land managed for multiple use surrounds the eastern and southern sides.

The Pacific Crest Trail and Twin Lakes Trail systems provide easy access to the lakes and scenic vistas. The entire unroaded area is accessed via Highway 26 and is less than a two hour drive from Portland.

Capability

Manageability and Boundaries

This unroaded area is large enough to be managed in an undeveloped condition and provide a semi-primitive/roaded natural recreation experience. The western and northern boundaries are defined by major roads (Highway 26 and 35). The eastern and southern boundaries are defined by lower standard roads. Consequently, these roads provide access for day and overnight use.

Natural Integrity and Appearance

The overall development of the Twin Lakes unroaded area is low. Development includes trails, timber harvesting, a firebreak on Bird Butte, roads, and some recreation facilities. There is evidence of recreation use and grazing. These features affect less than 10% of the area.

Natural ecological processes have not been greatly altered.

Opportunities for Solitude, Primitive Recreation and Challenge

Opportunities for solitude in the area are low because of the proximity to roads, trails (Pacific Crest National Scenic Trail), and timber harvest activities. Primitive recreation opportunities are moderate.

Special Features

The northern and eastern edges of this area contain segments of the 1846 Barlow Road, a part of the Oregon National Historic Trail, designated by Congress in 1978. The Barlow Road and the associated historical sites in the area (Pioneer Woman's Grave, Devil's Half Acre, Barlow Pass, and Grindstone) are in the process of being nominated to the National Register. The area is especially significant to the Warm Springs Indians as traditionally they held their first Huckleberry Ceremony in the area. Forest growth has subsequently decreased huckleberry production and curtailed use of the area for the ceremony.

There are no known sensitive plant or animal species identified in the area.

Availability

Recreation

The primary form of recreation use in the area is hiking and cross country skiing. Estimated carrying capacity by ROS class is as follows:

ROS Class	Capacity in RVDs/Year
RN	4,453
RM	4,185
SPNM	8,400

Wildlife and Fish

The area has the capability of providing wildlife habitat for the following management indicator species: spotted owl, pine marten, pileated woodpecker, ruffed grouse and deer/elk. A great blue heron rookery is present in the northeastern portion of the area. High quality wildlife habitat is limited by high elevations, steep slopes and poor soil conditions.

Eight miles of fish bearing streams and natural lakes support resident and stocked trout populations. A planned Bonneville Power Administration fisheries project would introduce steelhead, chinook, and coho salmon to the entire length of Barlow Creek. Maintenance and enhancement of resident and potential anadromous fisheries is a major fisheries objective in the area.

Water

The Twin Lakes, Green Lake, and other ephemeral tributaries flow easterly into Barlow Creek. Barlow Creek, subsequently, flows into the White River. To the west of the dominant ridge the ephemeral creeks flow to the Salmon River Meadows and Salmon River.

Livestock

The unroaded area falls within the White River Cattle Allotment. Current use is minimal and the area can potentially provide 20 AUM's.

Timber

The area contains approximately 5,649 acres of lands suitable for timber production. Species are Douglas-fir, noble fir, Pacific silver fir, mountain hemlock, Engelmann spruce, western white pine, and lodgepole pine. There is a current standing volume of 44.3 million cubic feet. The potential long run sustained yield from this area under intensive timber management would be 32.4 million cubic feet per decade.

Minerals and Energy

(H=High, M=Medium, L=Low)	
Leasable	
Lease Application Area (Acres)	
Geothermal	-
Oil and Gas	-
Resource Potential	
Geothermal	M
Oil and Gas	L
Locatable	
Number of Claims	-
Mineral Potential	L
Saleable	
Rock Materials Resource Potential	L

Geothermal and oil and gas lease applications exist directly north of the unroaded area. The proximity to the Mt. Hood Known Geothermal Resource Area suggest a moderate resource potential for geothermal. Exploration and development for oil and gas is rated low.

Fire

Past fire history indicates stand rotation fire frequency of 250-350 years with low intensity fire frequency of 75-125 years. Fuels in the area are predominately thin ground fuels. Fires burning in these fuels would be of low intensity with low spread rates.

Insects and Disease

The area was included in a forest level Western Spruce Budworm Study in 1983-84. There is evidence of spruce budworm activity in the area. Small and isolated outbreaks of the mountain pine beetle have occurred in the past.

Need for Roadless Areas

To the northwest is the Mt. Hood Wilderness. At a greater distance, to the west and east, respectively, are the Salmon-Huckleberry Wilderness and Badger Creek Wilderness. There is also an area that has, historically, been managed as unroaded: the Wind Creek area to the northwest. There are no unique ecosystems within this unroaded area.

Public input reflected through the RARE II public involvement process showed little interest in the Twin Area in comparison to the other unroaded areas.

Environmental Consequences

Table C-22 indicates the different management allocations, by alternative, for the Twin Lakes unroaded area. Table C-23 presents the first decade timber harvest and roading schedule by alternative. Alternatives H and I allocate the entire unroaded area to unroaded dispersed recreation. This would perpetuate the roadless character of the area and allow future classification as a wilderness.

Alternatives F, H, and I would maintain 97% of the unroaded character of the area through allocation to unroaded recreation or Special Old Growth. Alternative Q maintains 87% of the area's unroaded character through a combination of unroaded recreation and Northern Spotted Owl Habitat Area allocations. All four of these alternatives would maintain the unroaded qualities.

Alternatives A, C, NC, and E protect 0% of the unroaded character. In addition, these alternative make 98% - 100% of the area available for timber harvest.

Potential For Wilderness

Alternatives F, H, I, and Q maintain the opportunity for future wilderness designation. Alternatives A, C, NC, and E do not maintain future wilderness designation options.

Table C-22 Management Acres for Twin Lakes by Alternative

Management Areas	Alternative							
	NC	A	C	E	F	H	I	Q(Pre-ferred)
A4 Special Interest Areas				120	150	150	150	80
A5 Unroaded Recreation	0	0	0	0	5,880		5,890	3,320
A7 Special Old Growth						5,880		
A8 Northern Spotted Owl Habitat Areas								1,990
A11 Winter Recreational Areas								670
B1 Wild/Scenic/Recreational Rivers	50	50		50				
B2 Scenic Viewshed	2,650	2,650	0	2,460	40	40	0	10
B11 Deer & Elk Summer Range							50	
C1 Timber Emphasis	3,390	3,390	6,090	3,460	20	20	0	20

Note: Acres shown do not include allocations for Minimum Management Requirements

Table C-23 Estimated First Decade Harvest and Roading Schedule

	Alternative							
	NC	A	C	E	F	H	I	Q(Pre-ferred)
Suitable Acres Roaded/Harvested	440	440	565	437	4	4	2	2
MMCF Harvested	3.45	3.45	4.43	3.43	3.43	0.03	0.18	0.18
Roading Cost ($MM)	2.01	2.01	2.01	2.01	0.00	0.00	0.00	0.20

Map A-11 Wind Creek Roadless Area

Wind Creek

Wind Creek (06094), 5440 Acres

Description

History

The Mt. Hood National Forest identified and inventoried the unroaded area at Wind Creek Basin through the Mt. Hood Interagency Unit Plan. The final environmental impact statement was completed in November 1977 and management for the area was unroaded recreation.

Wind Creek was included in the RARE II inventory and was allocated for non-

wilderness uses. As part of RARE II, it was included in the release language of the RARE II Review Act of 1981, S-842.

Location and Access

Wind Creek is located on the Zigzag Ranger District in Clackamas County. It is 50 miles east/southeast of Portland and less than one mile west of the community of Government Camp.

The area is bounded on the north by Highway 26 (Laurel Hill) and on the south by Still Creek and Still Creek Road (2612). The eastern and western boundaries, respectively, are the Multorpor/Ski Bowl Ski Area and the Still Creek Trail #780. Roads of the Zigzag summer home area also access the western boundary. The Mirror Lake Trail, #664, provides non-motorized access three miles into the interior from the northeast corner.

Physiography and Soils

The area is a high elevation basin and sloping plateau. Steep, slightly dissected side slopes drop from the plateau into the Still Creek and Zigzag River drainage. Talus slopes and rock outcrops are prominent in the eastern portion of the area. Elevations range from 2400 feet near Camp Creek to 5066 feet at Tom, Dick and Harry Mountain.

Soils include harsh site sandy loams on the high plateau and gravelly silt loams on the steep side slopes.

Vegetation

The majority of the area is forested. Major tree species include Douglas-fir, western hemlock, red alder, noble fir, Pacific silver fir, and lodgepole pine. The understory is typical of Western Oregon with a variety of shrubs and forbs such as huckleberry, rhododendron, salal, and beargrass. Wet meadows occur in the basin with shrub and forb fields common on the steep drainage faces.

Current Use

Management direction for the area is unroaded recreation (Mt. Hood Planning Unit FEIS, 10/77). The management goals provide for semi-primitive recreation opportunities in a near natural unroaded setting. The outskirts of the area still provide a natural environment but within proximity of roads and trails.

Hiking, berry picking, camping, and hunting are the major uses. Total recreation use is estimated at 14,500 RVDs, with approximately 93% occurring in the Mirror Lake Basin.

Surroundings and Attractions

The Wind Creek Area is bordered by relatively well traveled roads to the north and south and by housing and ski area development to the west and east.

Mirror Lake, Wind Creek, and Tom, Dick and Harry Mountain are the major geographic features and attractions.

Capability

Manageability and Boundaries

The unroaded area is large enough to be managed in an undeveloped condition and provide a semi-primitive/roaded natural recreation experience. The boundaries are defined by major roads and developments. Roads to the north and south provide access to the area for day and overnight use.

Natural Integrity and Appearance

The overall development of the Wind Creek unroaded area is low, consisting of recreation trails and facilities. There is evidence of heavy recreation use at Mirror Lake, and ski trails and adjacent ski facilities can be observed. These features affect less than 25% of the area. Natural ecological processes have not been greatly altered.

Opportunities for Solitude, Primitive Recreation and Challenge

The opportunity for solitude and primitive recreation in the Wind Creek area is low. Its small size coupled with terrain offers limited screening potential. Off-site intrusions include highways and a developed ski area. There are low standard recreation facilities present.

Special Features

A lookout was once present on Tom, Dick, and Harry Mountain. The area was a favored Indian huckleberry picking area and may contain prehistoric sites. There are no known sensitive plant or animal species identified in the area.

Availability

Recreation

The primary form of recreation use in the area is hiking. Estimated carrying capacity by ROS class is as follows:

ROS Class	Capacity in RVDs/Year
RN	8,830
SPNM	7,086

Wildlife and Fish

The area has the capability of providing wildlife habitat for the following management indicator species: pine marten, ruffed grouse, pileated woodpecker, deer/elk and spotted owl. The quality of wildlife habitat is limited due to high elevations, steep slopes and poor soil conditions.

Still and Camp Creeks support populations of anadromous fish. Wind Creek and the natural lakes in the area support wild and introduced trout species. Fisheries objectives focus on maintaining self-sustaining fish populations and high water quality.

Water

Streams in the area flow into the Zigzag River drainage of the Sandy River basin. An unused powerline crossing through the northern portion of this area has been examined by a small hydroelectric proponent for reactivation. The opportunity for potential development still exists.

Timber

The area contains approximately 4141 acres of land suitable for timber production. Species are Douglas-fir, western hemlock, noble fir, Pacific silver fir, and lodgepole pine. There is a current standing volume of 29.2 million cubic feet. The potential long run sustained yield from this area under intensive timber management would be 30.6 million cubic feet per decade.

Minerals and Energy

(H=High, M=Medium, L=Low)	
Leasable	
Lease Application Area (Acres)	
Geothermal	-
Oil and Gas	-
Resource Potential	
Geothermal	M
Oil and Gas	L
Locatable	
Number of Claims	-
Mineral Potential	L
Saleable	
Rock Materials Resource Potential	L

The Mt. Hood area was included in a study prepared by the U.S. Geological Survey (Professional Paper 1300). Their study identified probable geothermal resource potential areas. The areas, including the Mt. Hood known Geothermal Resource area, are located directly north of the Wind Creek unroaded area. The potential for exploration and development is moderate. The potential for oil and gas exploration and development is low.

The U.S. Geological Survey study, recognized an area of substantiated mineral resource potential. The Lady Creek-Laurel Hill Area is adjacent to the northwestern boundary of the Wind Creek area. Claims for low grade metallic ores were staked in the Laurel Hill area in the 60's. No mining is known to have occurred and the potential for prospecting and development is low.

Fire

Fuels in the area are generally thin ground fuels with occasional areas of large concentrated woody materials. Fires burning in these fuels are generally of low intensity and low spread rates except where material is concentrated.

Insects and Disease

No significant insect or disease outbreaks have occurred in the unroaded area. The potential is low for significant outbreaks of insect or disease.

Need For Roadless Areas

In close proximity are the Mt. Hood Wilderness (north) and Salmon-Huckleberry Wilderness (southwest). The Badger Creek Wilderness is located to the east. There is also an area that has been managed as unroaded to the southeast; the Twin Lakes area. There are no unique ecosystems within this unroaded area.

Public input gathered through the RARE II public involvement process and during development of the Mt. Hood Interagency Unit Plan indicated a desire to maintain undeveloped recreation areas.

Environmental Consequences

Table C-24 indicates the different management allocations, by alternative, for the Wind Creek Unroaded area. Table C-25 presents the first decade timber harvest and roading schedule by alternative. (Within the existing unroaded area boundary, there is a small portion of the permit area for the adjacent developed ski area. This is common to all alternatives.)

Alternatives F, H, and I maintain 91% - 96% of the unroaded character of the area through a combination of unroaded recreation and Special Old Growth allocations. Alternative Q maintains 82% of the area's unroaded character through the unroaded recreation allocation. Alternatives F, H, and I protect the unroaded qualities, (alternative Q to a lesser degree) and therefore would maintain the opportunity for future wilderness designation.

Alternative E protects 57% of the unroaded character, while alternatives A, C, and NC maintain 0% of the unroaded character. Future wilderness designation would not be available under these alternatives.

Alternatives A, C, and NC make 97% - 98% of the area available for timber harvest activities.

Alternatives F, H, and I would maintain between 91% and 96% of the unroaded qualities and character primarily through the Unroaded Recreation allocation. Alternatives E and Q maintain 57% and 82% respectively on an unroaded condition. Alternatives A, C, and NC allocate 97% - 98% of the area to timber production, thereby, eliminating the unroaded character.

Potential For Wilderness

Alternatives F, H, I, and Q maintain options for future wilderness designation. Alternatives A, NC, and C eliminate the potential for future wilderness designation opportunities.

Table C-24 Management Acres for Wind Creek by Alternatives

Management Areas	Alternative							
	NC	A	C	E	F	H	I	Q(Preferred)
A4 Special Interest Areas				80	10	10	10	10
A5 Unroaded Recreation	0	0	0	3,080	4,960	4,510	5,230	4,450
A7 Special Old Growth						660		
A9 Keysite Riparian	20	20		130	200	20	20	20
A10 Developed Recreational Ski Areas		20			20	20	20	20
A11 Winter Recreational Areas	110	110	110	220	220	220		220
B2 Scenic Viewshed	950	0	970	1,080	30	0	0	80
B6 Special Emphasis Watershed	0	0	0	870	0	0	0	640
B9 Wildlife/Visual Areas							160	
C1 Timber Emphasis	4,360	5,290	4,360	0	0	0	0	

Note: Acres shown do not include all allocations for Management Requirements

Table C-25 Estimated First Decade Harvest and Roading Schedule

	Alternative							
	NC	A	C	E	F	H	I	Q(Preferred)
Suitable Acres Roaded/Harvested	369	368	403	74	1	0	6	27
MMCF Harvested	2.60	2.60	2.04	0.52	0.08	0.00	0.04	0.19
Roading Cost ($MM)	1.96	1.96	1.96	0.78	0.00	0.00	0.00	0.23

Appendix D

Management Direction not in the Forest Plan

Appendix D
Management Direction Not in the Forest Plan

Appendix D - Management Direction not in the Forest Plan

Introduction

Management Direction is intended to provide the framework within which all activities of the Forest are carried out. This framework includes Forestwide Goals, Desired Future Condition, Management Objectives and Standards and Guidelines; it also includes Management Area specifically Management Prescriptions. Management Direction encompasses application of all laws and regulations applicable to Forest management. The purpose of this Appendix is to describe management direction content which was not included in Management Direction for the preferred alternative.

Each of the Alternatives considered have their own Management Direction. The entire Management Direction package is for the Preferred Alternative (Q) presented in Chapter 4 of the Final Land and Resource Management Plan. With the exception of the No Change Alternative (NC), combinations of all or selected portions of the Management Direction for the Preferred Alternative make up the Management Direction for the other alternatives. Management Area specific management direction differs little between alternatives. However, the quantity of acreage allocated to individual Management Areas differs greatly among the alternatives. Forestwide Standards and Guidelines may also vary substantially among the alternatives.

Alternative NC (No Change)

Alternative NC, No Change, would not adopt the Management Direction of the Forest Plan. The Management Direction for this alternative was established by the following existing Unit Plan documents:

- The Dalles Municipal Watershed, 1972
- Roaring River/Salmon River EIS, 1974
- Eagle Creek Watershed, 1975
- Huckleberry EIS, 1975
- Mt. Hood Planning Unit, 1977
- Badger-Jordan, 1978
- Forest Timber Management Plan, 1978
- Bull Run Watershed FEIS, 1979

The No Change Alternative does not provide for compliance with the National Forest Management Act 1976. It does, however, comply with the following legislation:

- Wilderness Act 1964, Oregon Wilderness Act, 1984
- Columbia River Gorge National Scenic Area Act, 1986
- Omnibus Oregon Wild and Scenic Rivers Act, 1988

Management Direction Not In The Preferred Alternative

The following list describes management direction considered in alternatives other than the Preferred Alternative. These items are not included in the Forest Plan Management Direction.

Special Old Growth

Two types of Management Area A7 Special Old Growth were considered in developing the alternatives. Type 1, A7 Management Areas, include large contiguous blocks of existing old growth or mature forest intended to provide for an old growth forest community (or ecosystem) over time. Type 2, A7 Management Areas, include relatively small, localized portions of other existing or historic old growth ecosystems, where large trees and some old growth characteristics can be easily accessed and appreciated by Forest visitors. The Management Direction for both Type 1 and Type 2 is the same and is described in the Forest Plan. The difference between alternatives is based on which type we used in building the alternative and how much acreage was included.

The Preferred Alternative includes Type 2, A7 Special Old Growth Management Areas, but does not include Type 1. Alternative F also included Type 2; whereas, Alternatives H and I include Type 1.

Maximum Modification VQO

Maximum Modification visual quality objectives (VQO) are not included in the Preferred Alternative. The VQO allowing the highest degree of change in a landscape's visual character included in the Preferred Alternative is Modification. Alternative F also does not include a Maximum Modification VQO. Alternatives A, C, NC, E, F, H and I allow for Maximum Modification as the lowest VQO.

Powerline Corridors

The Forest Plan does not contain a Management Area prescription for utility transmission corridors. The Regional Corridor Study and the Bonneville Power Administration did not identify a need for additional major corridors across the Forest. Forest Plan Management Direction does however, contain Forestwide and Management Area specific Standards and Guidelines addressing management of existing utility corridors, including expansion.

Range Resources Management Levels

Four Range Resource Management Levels (FSH 2209.21 R6 Supp) are recognized in the Forestwide Range Management Standards and Guidelines. Levels B (basic stewardship) and D (optimized forage utilization) are not included in the Forest Plan Management Direction. The Preferred Alternative prescribes Level A Management without livestock) for 3 existing vacant range allotments, as well as, a large portion of the Forest where commercial livestock grazing has not occurred in recent years. The Preferred Alternative prescribes Level C (full utilization of allocated forage) for six existing Range Allotments.

Appendix E

Wild and Scenic River Eligibility Studies and Suitability Study for East Fork Hood River

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Appendix E - Wild and Scenic River Eligibility Studies and Suitability Study for East Fork Hood River

The Wild and Scenic Rivers Act, as amended, was enacted by Congress to provide Federal protection for selected free-flowing rivers within the United States. During the preparation of the Draft Environmental Impact Statement (DEIS) and the Proposed Land and Resource Management Plan for the Mt. Hood National Forest, the Clackamas, Roaring, Salmon, and White Rivers were evaluated for their suitability as Wild and Scenic Rivers. Following release of the DEIS, these four rivers and the Sandy River were all formally designated as Wild and Scenic Rivers in the Omnibus Oregon Wild and Scenic Rivers Act of 1988 (PL 100-557).

Analysis of input to the DEIS and proposed Plan identified 12 additional rivers on the Forest that appeared to meet the criteria outlined in the joint Department of Agriculture/Department of Interior Final Guidelines for Eligibility, Classification and Management of River Areas (Secretary's Guidelines). These rivers are:

- 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 North Fork Breitenbush River

As a result, the Forest Supervisor assigned an Interdisciplinary (ID) Team to assess the eligibility of these rivers on the Forest. Due to time constraints, the Forest was not able to complete suitability studies on all of the rivers found eligible. An ID team was assigned to complete the suitability study of the East Fork Hood River (East Fork) because of the need to resolve uncertainties to the Mt. Hood Meadows Ski Area master planning effort caused by the eligibility finding. The detailed suitability assessment for the East Fork is contained in this appendix following the eligibility assessments.

For those rivers found eligible in this assessment other than the East Fork, the Wild and Scenic values will be protected through the detailed suitability study. This suitability study will be done as a comprehensive study incorporating all the eligible rivers and is scheduled for completion by the end of 1994. Those rivers found suitable will then be recommended to Congress for inclusion into the National system and will continue to be protected until Congressional action. Those rivers not found suitable will be released from consideration for inclusion in the National system and will be managed and protected in other ways as specified in the Forest Land and Resource Management Plan.

Eligibility Assessment Process

Analysis of input to the DEIS identified the 12 rivers on the Forest for further evaluation as potential Wild and Scenic Rivers. Once the above list was developed, each river was evaluated to determine its eligibility. In order to be eligible a river must meet both of the following criteria:

- The river is free-flowing.
- The river or river segment possess scenic, recreational, geological, fish, wildlife, historical, cultural, or ecological values which are judged to be outstandingly remarkable.

The determination of whether a river contains outstandingly remarkable values is a professional judgement. To make this determination a core ID team was assembled to assess the river resources and values. This team consisted of a wildlife biologist, fisheries biologist, landscape architect, and a recreation specialist. The most qualified river experts from each Ranger District also were included on the team for the assessment of the rivers on their Districts. Other resource specialists such as an archeologist, hydrologist, ecologist, and a geologist also participated in the analysis of each river and review of the assessment.

Specific evaluation criteria listed below were developed by the ID team and other specialists to assess river values and determine if they were truly outstandingly remarkable. These criteria were shared with others within and outside the Forest Service for additional assistance in their development.

Each river was first evaluated to determine if it was free-flowing. In this phase, if it was necessary, the river was divided into segments for more detailed evaluation. This division was based on:

- Major differences in landform, land use, etc. (i.e. canyon vs broad plain, virgin forest vs heavily cut over, forest vs agricultural, etc.)
- Potential classification (Wild, Scenic, or Recreational)

If the river or river segment was found not to be free-flowing, it was determined "not eligible and was not considered further. If a river or river segment was found free flowing, it was then evaluated to determine if it did have outstandingly remarkable values. If any one value was found to be outstandingly remarkable, the river or river segment was then declared to be "eligible". The ID team and specialists consulted with specialists from other areas, both within the Forest Service and other public and private organizations during the evaluations.

Classification

Eligible segments were then classified using the Secretary's Guidelines and given a classification of Wild, Scenic, or Recreational based on the current level of development along the river. Wild segments are primitive in character and access is generally only by trail. Scenic segments are primarily undeveloped, retaining a primitive character but may be accessible in places by road. Recreational segments are readily accessible by road and may have development along the river.

Based on this system, we found:

- 11.8 miles eligible for Wild classification
- 36.3 miles eligible for Scenic classification
- 56.5 miles eligible for Recreational classification

Interim Management and Suitability Studies

Interim management, occurring after Final Forest Plan approval and prior to recommendation for designation or release from consideration for inclusion in the National Wild and Scenic Rivers System will follow the standards outlined in the Forest-wide Direction, Chapter 4 of the Forest Plan. These standards will generally apply to resource impacts occurring within the river channel or corridor, approximately one-quarter mile from each bank. Where identified outstandingly remarkable values extend beyond the one-quarter mile corridor, they will also be protected as identified in the standards.

The suitability study for the East Fork has been completed as a part of this plan. The recommended method for completion of the remaining suitability studies is to conduct one comprehensive study evaluating all other rivers found eligible. This study is scheduled for completion by the end of CY 1994, dependent upon adequate funding.

Eligibility Evaluation Criteria

The following evaluation criteria were used in the assessment of the eligibility of the identified rivers on the Mt. Hood National Forest. The features evaluated for eligibility need to be **directly river related.** This means that they should either:

- be located in the river or within the river corridor (generally within 1/4 mile),
- contribute substantially to the functioning of the river ecosystem,
- owe their location or existence to the river, or
- have high potential for outstanding distant views as viewed from a river having high public use.

To be eligible, a river will have at least one outstandingly remarkable value. However, a river may be found eligible because of a large number of unusual combination of substantial features.

Non-river related features can be noted as contributing to the overall value of the river but are not to be used as criteria for evaluating eligibility.

For this evaluation, the physiographic provence referred to is the central portion of the Cascade Mountain Range. This area was the basis for the regional comparison.

Because of the closeness of the Portland metropolitan area to the Forest, users from this area are considered as local users for this evaluation. Other users from around the state are considered as regional users.

Scenic

Outstandingly Remarkable = 4

For the landscape elements of landform, rock form, water form, and vegetative patterns, the combination is unique, harmonious and is highly memorable in 3-4 of the elements

The views of the surrounding scenery and photographic attractions are highly diverse over the majority of the river or river segment length and not common to other rivers in the physiographic region. Photos taken along the river of often featured in national and regional publications.

Human alterations are absent or contribute favorably to visual quality.

Substantial = 3

For the landscape elements, the combination may be unique in one or two elements and is still memorable.

The views of the surrounding scenery and photographic attractions have moderate to high diversity over the majority or highly diverse for part of but less than 1/2 the river or river segment length. Photos may be featured in state and local publications.

Human alterations do not reduce the overall visual quality.

Moderate = 2

Combination of landscape elements are relatively common to the character type but may not be found throughout the physiographic region. Combination of elements is not highly memorable but can still be pleasing to the viewer.

There is moderate diversity with some good views for less than 1/2 the river length. There are photo opportunities for tourists and local residents but are not usually featured in publications.

Human alterations are generally compatible but may cause minor reduction in visual quality.

Low = 1

Landscape elements are very common and are found throughout the physiographic region. Views are not memorable at all.

There is little diversity along the river and photo opportunities are minimal for the length of the river or river segment.

Human alterations are often not compatible and may cause major reduction in visual quality.

Recreation

Outstandingly Remarkable = 4

Recreation opportunities related to the river are or have the potential to be unique enough to attract users from a national or regional base. Users would be willing to travel long distances to use the river resources for recreational purposes. These opportunities must be river related, (i.e. fishing, boating, rafting, kayaking, hiking, or driving along river.)

Interpretive opportunities on or related to the river are exceptional and are attracting or have the potential to attract visitors from a national or regional base.

River and/or corridor fill an important gap in the regional ROS as it pertains to river recreation

River and associated attractions are nationally or regionally unique enough to attract large numbers of regional and local users or provide opportunities for a rare combination of recreation users (i.e. canoeists and eagle watchers).

River has the potential for providing settings for national or regional competitive events.

Substantial = 3

Recreation opportunities related to the river are found in other places throughout the region but are still relatively unique for rivers within the region. Users would primarily be local users though there may be some users from around the region coming to use the river for its recreation opportunities.

Interpretive opportunities would be of a high enough quality to attract local users with occasional users within the region coming to view the attraction.

River and/or corridor would fill a gap in a multi-forest ROS

River has the potential for providing settings for competitive events that may be found in other locations within the region but are still considered of a good quality.

Moderate = 2

Recreation opportunities are relatively common throughout the region and use of the river and its attractions is almost exclusively by local users.

Some interpretive opportunities exist but they are limited enough that they would only attract some local users.

River would fill a gap of Forest ROS

Opportunity for competitive events exists but would be only of a local nature.

Low = 1

Recreation and interpretive opportunities for the river are very limited or non-existent.

Geologic/Hydrologic

Outstandingly Remarkable = 4

An unusual example of a geologic feature, process, or phenomena, (such as formation, fault, esker, meander, drainage pattern, earth flow, etc.) that is unique to the nation or physiographic region. It may provide exceptional opportunities for scientific studies, or be in an unusually active stage of development and can be considered a "textbook" example.

The waterway offers nationally or regionally unique examples of free flowing nature; such as flooding, bank or bed erosion, island building, downcutting, etc., or water created features such as falls, sinks, caverns, springs, etc.

The river water itself is one of the best examples of clarity, purity, glacial "milk", etc. or the combination of water chemistry and temperature supports lifeforms unique to the country or physiographic region.

Substantial = 3

Feature, process or phenomena is found in other places within the physiographic region but is still relatively unique to the region. It is not quite a "textbook" example but can still be easily seen studied and interpreted.

Examples of free flowing nature or water created features are found in other places within the physiographic region but are still relatively unique to the region.

The characteristics of river water and water chemistry and temperature are found within other places within the physiographic region but are still relatively unique to the region.

Moderate = 2

Features, processes, phenomena, free flowing nature, water created features, water characteristics and chemistry are relatively common but may not be found in all rivers within the physiographic region.

Low = 1

Similar to moderate but features, processes, etc. are common enough to be found in essentially all rivers throughout the region.

Fisheries

Outstandingly Remarkable = 4

River provides prime quality habitat for federally listed or candidate T & E species or unique wild stocks of fish and those species are found within the river segment.

River provides nationally or regionally unique habitat for individual fish species or combination of species or there is a unique combination of habitats.

River provides national or regional opportunities for scientific study and/or interpretation.

River nationally or regionally is one of the top few producers of important fish species populations.

Substantial = 3

River provides high quality habitat for listed or candidate R-6 T,E,& S species and those species are found within the river.

Unique species, combination of species, or combination of habitats are found in some of the other rivers within the region but are still relatively uncommon.

River provides local opportunities for scientific study and/or interpretation.

River regionally has a high production rate of important fish species but is not one of the top few in the region.

Moderate = 2

River provides some habitat for federal and R-6 listed or candidate species with habitat quality considered moderate. Habitat for other species of fish found within the river is relatively common throughout the region. Spawning and rearing habitat is of moderate quality. Productivity is considered moderate in comparison to other rivers in the region.

Low = 1

Habitat is of marginal quality and river productivity is low in comparison to other rivers in the region.

Wildlife

Outstandingly Remarkable = 4

River or the area within the river corridor provides prime quality habitat or is a critical link in habitat conditions for federally listed or candidate T & E species and those species are found within the river corridor. Contiguous habitat is of a size and condition so that it makes a significant contribution to meeting biological requirements of the species.

River or area within the corridor provides national or regional opportunities for scientific study and/or interpretation of wildlife.

River or area within the corridor provides nationally or regionally unique habitat for wildlife in a natural and/or undisturbed condition. Contiguous habitat is of a size to meet the biological needs of the species or contains a combination of wildlife use and habitat conditions that makes it nationally or regionally unique.

Substantial = 3

River or the area within the corridor provide quality habitat or is an important link in habitat conditions for R-6 T,E,& S species and those species are found within the corridor. Contiguous habitat is of a size to meet most of the biological needs of the species.

River provides local opportunities for scientific study and/or interpretation.

River or area within the corridor provides unique habitat in relatively good condition but may have some disturbance to lower habitat quality. Contiguous habitat is of a size to meet most of the biological needs of the species.

Moderate = 2

River or area within the corridor provide some habitat for federal and R-6 listed or candidate species but habitat is not of a quality or amount to meet all the biological needs of the species. Species may or may not be present within the area.

There are some opportunities for scientific study and/or interpretation of wildlife, but the opportunities are limited.

Some unique wildlife habitat may be present but not of a quality or amount to meet most of the biological needs of the species.

Low = 1

Critical wildlife habitat is not present or is in poor quality condition. Opportunities for scientific study and/or interpretation of wildlife are very limited.

Ecological/Biological

Outstandingly Remarkable = 4

River or related area within the river corridor provides prime quality habitat for Federally listed and candidate T & E plant species and species is present in that habitat.

River or related area within the corridor contains nationally or regionally unique combinations of plant communities or a rare or displaced plant community (bog, swamp, meadow, etc.)

River or related area within the corridor contains a nationally or regionally unique natural or undisturbed riparian community.

Substantial = 3

River or related area provides very high quality habitat for R-6 T,E,& S species and species is present in the habitat.

Unique combinations of plant communities or a rare or displaced plant community are present but may be found in other locations throughout the region.

River or related area contains a high quality riparian community but may have some disturbance to lower the quality of the community.

Moderate = 2

River or related area has isolated locations of quality habitat for federally or R-6 listed or candidate species. Species may or may not be present.

Plant communities found within and adjacent to the river are relatively common but not found along all rivers of the region.

Low = 1

There is little, if any, quality habitat suitable for any federally or R-6 listed or candidate species.

Plant communities found within and adjacent to the river are very common and found throughout the region.

Historical/Cultural

Site type listing:

- House pit depressions easily visible
- Rock shelters visible and visitable
- Rock art that is interpretable
- Basket trees visible
- Hunting blinds/Rock walls/Other rock structures
- Mining Structures (flumes, ditches, adits, mines, buildings)
- Homesteading/Ranching structures (barns, houses, outbuildings)
- Transportation sites (historic roads, railroads, and wagon trails)
- Rural Industrial Structures (lumbering, water power, fisheries)
- Historic USFS Administrative Structures (CCC structures, community kitchens, early ranger stations)

Sites must be within the river corridor and have a relationship to the river.

Outstandingly Remarkable = 4

Three or more types of sites shown above in very good, interpretable condition. An exceptionally high density of one or two of the site types in very good interpretable condition listed would also qualify as outstanding. Very good condition means that the site is essentially undisturbed, keeping site integrity high.

A site or site complex which has national importance for interpreting prehistory or history.

Site(s) which embody nationally or regionally outstanding examples of an architectural style or types of construction.

Site(s) which embody a historical theme (ranching, military, mining, trail) that is nationally important and available for interpretation or is associated with a nationally prominent figure.

Site(s) represent a unique important historic event (battle, massacre, treaty) and the environment is essentially the same as when the event took place.

Substantial = 3

Two of the types above are in very good, interpretable condition.

Site or complex has regional importance for interpreting prehistory or history.

Site(s) which embody a historical theme that is nationally important but is difficult to visit and/or interpret or that is regionally important and is available for interpretation, or is associated with a regionally prominent figure.

Site(s) represent a unique historic event and the local environment has been modified noticeably but retains some similarity to the original environment.

Moderate = 2

One of the site types above are in very good, interpretable condition.

Site(s) would have local importance for interpreting prehistory or history.

Site(s) which embody a historical theme is locally important or associated with a locally prominent figure and is available for interpretation. Other sites of greater importance may be present but would be difficult to visit and/or interpret.

Site(s) represent a unique important historic event but the site is substantially disturbed.

Low = 1

Some sites may be present but they are disturbed enough that they have very little, if any integrity.

There may be isolated finds indicating historic or prehistoric use but due to rarity or disturbance, they are not considered important for describing a specific site.

Evaluated River Segments

The following table summarizes the river segments considered for eligibility, their mileage, the eligibility finding, their outstandingly remarkable values, and their highest level of potential classification (wild, scenic, or recreational) along the river corridor.

Eligible River Narratives

This section summarizes by river segment the rating and description of the values present along the river. Ratings are based evaluation criteria listed above.

West Fork Hood River

Segment 1

From Confluence McGee Ck and Elk Creek to N. Sec Line, Sec 24, T1S, R8E

Mileage: 1.5 miles

Free flowing: Yes

Scenic: 1, Low

Area along river is heavily impacted by timber harvest and presence of high voltage powerlines making opportunities for high quality views and photo attractions low. Landscape elements are relatively common for the region. The above factors gave scenic values a rating of a "1".

Recreational: 2, Moderate

River receives moderate fishing use primarily by local users. Development of new recreation opportunities is limited since past timber harvest and presence of powerlines would adversely impact the recreational experience. Interpretive opportunities along the river are very limited. Because of limited recreational opportunities and the fact the use is essentially local in nature, recreational values were rated a "2".

Geologic/Hydrologic: 2, Moderate

There is a mudflow that has come down Ladd Creek that changed the location where Ladd Creek flows into the river somewhat. Mudflows of this nature are relatively common but are not found along all rivers in the region. Hydrologic factors such as flow and water quality characteristics are common in comparison to most of the rivers throughout the region. Because of the relative common nature of the above, the geologic/hydrologic values were rated a "2".

Fisheries: 3, Substantial

River provides high quality anadromous habitat that is found in some but not all rivers throughout the region. Of all the forks of the Hood River, the West Fork is considered to have the highest quality habitat for anadromous species. Timber harvest activity in the past along the river has lowered this quality somewhat. Fish production rate is relatively high, but the river is not one of the top producers for the region. The summer steelhead found within the river are introduced and there is some hatchery augmentation to the anadromous fishery. The river does receive relatively heavy fishing pressure, primarily by local users. Because of productivity and

Table E-1 Evaluated River Segments

River Segments	Mileage	Eligibility Status	Outstandingly Remarkable Value	Classification Based on Development
West Fork Hood River				
Segment 1 - Confluence McGee and Elk Creek to N. Sec. Line, Sec. 24, T1S, R8E	1.5	Not eligible	No outstandingly remarkable values identified	
Setment 2 - N. Sec. Line, Sec. 24, T1S, R8E to Forest boundary	3.8	Not eligible	No outstandingly remarkable values identified	
Middle Fork Hood River				
Confluence Clear and Coe Branches to Forest boundary	4.7	Eligible	Recreational, Geologic/Hydrologic, Ecological/Botanical	Scenic
East Fork Hood River				
Segment 1 - Headwaters to Umbrella Falls	1.0	Not eligible	Not free flowing	
Segment 2 - Umbrella Falls to Highway 35	1.5	Eligible	Ecological/Botanical	Scenic
Segment 3 - Highway 35 to Forest boundary	13.4	Eligible	No one outstandingly remarkable value but a combination of recreational, geologic, wildlife and ecological/botanical values, all of which were substantial.	Recreational
ZigZag River				
Segment 1 - Headwaters to Wilderness boundary	2.9	Not eligible	No outstandingly remarkable values identified	
Segment 2 - Wilderness boundary to Sandy River	9.0	Eligible	Historical/cultural	Recreational
Eagle Creek				
Segment 1 - Headwaters to W Sec. line, Sec. 20, T3S, R6E	7.2	Eligible	Fisheries, Wildlife	Wild
Segment 2 - Sec. line, Sec. 20, T3S, R6E to Forest boundary	1.1	Eligible	Fisheries	Recreational
North Fork Clackamas				
Segment 1 - Headwaters to N. Sec. line, Sec. 17, T4S, R5E	10.8	Eligible	Fisheries	Scenic
Segment 2 - N. Sec. line, Sec. 17, T4S, R5E to Slackwater, N. Fork Reservoir	2.7	Eligible	Fisheries	Recreational
South Fork Clackamas				
Segment 1 - Headwaters to E. Fork of S. Fork	4.7	Not eligible	No outstandingly remarkable values identified	
Segment 2 - E. Fork of S. Fork to Clackamas	4.2	Eligible	Fisheries	Scenic

Table E-1 Evaluated River Segments (continued)

River Segments	Mileage	Eligibility Status	Outstandingly Remarkable Value	Classification Based on Development
Fish Creek				
Headwaters to Clackamas	13.5	Eligible	Fisheries	Recreational
South Fork Roaring River				
Headwaters to Roaring	4.6	Eligible	Wildlife	Wild
Oak Grove Fk. Clackamas				
Segment 1 - Timothy Lake Dam to Slackwater, Harriet Lake	10.0	Eligible	Ecological/Botanical	Recreational
Segment 2 - Harriet Lake Dam to Clackamas River	4.7	Not eligible	Not free flowing	
Collawash				
Segment 1 - Headwaters to Buckeye Ck.	11.0	Eligible	Fisheries	Scenic
Segment 2 - Buckeye Ck. to Clackamas	6.8	Eligible	Geological, Fisheries	Recreational
North Fork North Fork Breitenbush				
Breitenbush Lake to N. Fk. Breitenbush	4.1	Eligible	Scenic, Recreational, Geologic/Hydrologic, Ecological/Botanical	Scenic

habitat quality, the segment was given a rating of "3" for fishery values.

Wildlife: 2, Moderate

Area provides some good riparian habitat but the quantity is limited. Timber harvest activities have provided vegetative diversity to meet some of the needs of big game species but this type of habitat is relatively common throughout the region. Thermal cover is limited in the corridor due to the large amount of harvest activities. Area is important as a travel corridor for big game species between summer and winter range. There are no known T & E species inhabiting the corridor and habitat quality and amount for these species is limited. Because of the importance of the area as a travel corridor, wildlife values were rated a "2".

Ecological/Botanical: 2, Moderate

Area along the river provides some good quality riparian habitat but the quantity and quality is limited due to past management activities. There are no known sensitive plants within the corridor. Because of the presence of some good quality riparian habitat, ecological/botanical values were rated a "2".

Historical/Cultural: 1, Low

There is some evidence of past railroad logging within the corridor and adjacent areas but any sites within the area have been disturbed enough to make site integrity very low. There are no other known significant sites within the corridor. Because of this, historical/cultural values were rated a "1" for the segment.

Eligible: No

There were no outstandingly remarkable values found within the segment.

Segment 2

From N. Sec Line, Sec 24, T1S, R8E to Forest boundary.

Mileage: 3.8 miles

Free flowing: Yes

Scenic: 2, Moderate

In the lower portion of the segment, the river flows through a narrow canyon with smaller cliff faces and talus slopes at the rivers edge. There are also small isolated groves of trees along the river edge. Upstream from the canyon are some beaver ponds surrounded by forested land. There is one timber harvest unit on the private land marked for harvest this year which borders the river. The combination of the above is considered to be relatively common and pleasing to the viewer, though not highly memorable. Long distance views are limited from the river. There are opportunities for scenic photographs of the river itself in places. Roads along the west side of the river, as well as some timber harvest taking place within the corridor reduces the scenic quality of the area some. The combination of the above factors gave a combined rating of "2" for scenic values.

Recreational: 2, Moderate

Currently use is low within the corridor area but there is potential for development of a trail into places along the river. Most anticipated use would be for fishing access and would be local in nature. Because of this, recreational values were rated a "2".

Geologic/Hydrologic: 3, Substantial

River is bounded by cliffs along parts of the segment and river contains numerous deep pools. There is some glacial flour in the water that gives the pools an aquamarine color in the deeper pools. The combination of the cliffs, and deep pools, as well as the glacial effect can be found in some other rivers in the region, but it is still relatively unique. Because of this, these values were rated a "3".

Fisheries: 3, Substantial

River provides high quality anadromous habitat that is found in some of the rivers throughout the region, but not all. Of all the forks of the Hood River, the West Fork is considered to have the highest quality habitat. Fish production rate is relatively high but the river is not one of the top producers for the region. The summer steelhead found within the river are introduced and there is some hatchery augmentation to the anadromous fishery. The river does receive relatively heavy fishing pressure, primarily by local users. Primarily because of the productivity and habitat quality, the segment was given a rating of "3" for fishery values.

Wildlife: 2, Moderate

Area along the river provides some good riparian habitat in good condition to meet the needs of a variety of wildlife species, but these areas are limited due to topography. There are also small, scattered patches of old growth type vegetation which could meet some, but not most of the needs of the Northern Spotted Owl, a federally listed threatened species. Based on the above, wildlife values were rated a "2".

Ecological/Botanical: 2, Moderate

The area along the river provides some good, isolated examples of undisturbed riparian habitat. These areas are limited in size due to topography. There is some old growth timber types along the river, but they are also limited due to past harvest activities and topography. There are no known sensitive plants within the river corridor. Because of the isolated nature of the riparian and old growth type habitats, these values were rated a "2".

Historical/Cultural: 1, Low

Due to steep terrain, there has been little historical or prehistorical use in the canyon. There are no known sites within the corridor and potential for additional sites is considered to be low. Because of this, these values were rated a "1".

Eligible: No

There were no outstandingly remarkable values found within this segment.

Middle Fork Hood River

River section evaluated flows from confluence Clear Branch and Coe Branch to Forest boundary.

Mileage: 4.7 miles

Free flowing: Yes

Scenic: 3, Substantial

River flows along the western edge of a lava flow of about 7,000 years in age. This flow provides substantial scenic variety and very unique rockform. Vegetation patterns and stream characteristics are found in other locations in the region yet are still relatively unique. Views and photo attractions are substantial with combination of lava flows, adjacent stream, vegetation, and in places long distance views of the Mt. Hood area. Human alterations are virtually absent, thereby not adversely affecting the visual quality of the area. Based on the above factors, scenic values have a rating of a strong "3".

Recreational: 4, Outstandingly Remarkable

While recreation use in the area is currently limited to dispersed day or overnight use primarily by local users, the area has a high potential for interpreting volcanic processes that could attract users from around the region to view the attraction. The lava flow is easily accessible, and is an excellent example of some of the volcanic forces that helped form the Cascades as well as the biological plant successional processes that are taking place as plants reestablish themselves on the lava flow. Because of the potential regional importance of the area recreationally, these values were given a rating of "4".

Geologic/Hydrologic: 4, Outstandingly Remarkable

The river is bounded on the east side by the Parkdale Lava beds, an excellent example of an "ah ah" type of lava flow which is typified by rough, jagged, and cindery surfaces. Large deposits of stream and lake sediments at the upper end of the lava flow indicate that the river was once dammed by the lava flow. High quality flows of this nature are rare for the region, and can be considered a "textbook" example which can be easily studied and interpreted. Because of these factors, geologic/ hydrologic values were rated a "4".

Fisheries: 2, Moderate

Habitat quality is considered moderate for anadromous fish within the segment. Bull trout, a category II threatened and endangered species is known to be present above the segment. It could possibly be found in the segment but that has not been confirmed at this time. Because of moderate habitat quality, fishery values were rated a "2".

Wildlife: 3, Substantial

The area along the river is important for big game as a travel corridor. The riparian areas along the river are very high quality due to minimal disturbance, therefore meeting the biological needs of the species using the area. Due to riparian areas importance and condition, wildlife values were rated a "3".

Ecological/Botanical: 4, Outstandingly Remarkable

The lava flow provides an excellent example of successional stages taking place in the reestablishment of vegetative cover on the lava flow. The southern, or upper, end of the flow already has trees and other vegetation becoming reestablished where the northern, or lower, end of the flow is still virtually barren. The diversity throughout the lava flow provides a very unique display of natural processes in action in one location. Because of this, ecological/botanical values were rated a "4".

Historical/Cultural: 1, Low

There are no known sites identified within the river corridor though the area has not been surveyed extensively. Due to the high use of the area by big game wildlife species, there is the possibility of prehistoric transient hunting camps within the corridor. Because of the lack of sites found at this time and the potential for additional sites being found is considered moderate to low, the historical/cultural values were rated a high "1".

Eligible: Yes

The river segment is found eligible based on the outstandingly remarkable values found in the recreational, geological/hydrological, and ecological/botanical values.

Potential Classification: Scenic

This determination is based on the fact that the shoreline of the river is still largely primitive for the length of the segment. There is road access to the southern end of the lava bed and roads which are inconspicuous adjacent to the river. Because of the presence of the roads the segment would not qualify as Wild, but it does meet all the criteria for Scenic.

East Fork Hood River

Segments 1 and 2 of this river are within the Mt. Hood Meadows Ski Area boundary. The ski area is in the process of completing a Master Planning effort to evaluate expansion opportunities. Segments 2 and 3 of the river were found eligible. The eligibility finding in Segment 2 has the potential to impact the ongoing master planning effort. To reduce uncertainty to that planning effort, segments 2 and 3 of this river were assessed for their suitability as Wild and Scenic Rivers. The suitability assessment is contained in the last section of this appendix.

Segment 1

From Headwaters to top of Umbrella Falls

Mileage: 1.0 miles

Free flowing: No

River is not considered free flowing since it is channelized and/or culverted for a significant of the length in this segment and is therefore not riverine in nature. The channelizing and culverting was done as part of the ski area operation at Mt. Hood Meadows Ski Area.

Eligible: No

This is based on the fact that the river is not considered free flowing.

Segment 2

From Top of Umbrella Falls to Highway 35 immediately below Sahalie Falls

Mileage: 1.5 mi

Free flowing: Yes

Scenic: 3, Substantial

River flows over Umbrella Falls at the beginning of the segment, through forested and extensive wet meadow areas, and then over Sahalie Falls before crossing under State Highway 35 into Segment 3. The diversity provided along the river is considered substantial. Two accessible waterfalls, several views of Mt. Hood, and vegetative diversity in the wetland meadow complex below Umbrella Falls provide opportunities for views and photo attractions which are considered outstanding. The presence of a sewer plant and road along a portion of the river do cause some minor reduction in visual quality. Overall the Scenic value was rated a "3" for the segment.

Recreational: 2, Moderate

Recreation use along the middle of the segment is limited due to access but there is trail access to both the upper and lower portions of the segment near the two waterfalls. Use on the trail is low to moderate and is generally limited to users from local communities and the Portland metropolitan area. There is potential for interpretive opportunities related to the waterfalls and the meadow area, if made accessible. These interpretive opportunities would probably draw mostly local users with some users coming from around the region. While good recreational opportunities exist, most use is essentially by local users; therefore, recreational values were rated a strong "2".

Geologic/Hydrologic: 3, Substantial

The river segment contains two waterfalls of a type that can be found in other places throughout the region but overall are still relatively unique. The hydrologic factor of a high water table is one of the main factors in the presence of the stringer meadow complex. Springs within the meadow complex help to contribute to the year round flow in the river, something which can be found in some of the other rivers throughout the region. While the features can be found in other rivers

throughout the region, they are still relatively unique and therefore were rated a "3".

Fisheries: 1, Low

River provides low quality habitat for native species, and anadromous fish are not present because Sahalie Falls blocks upstream passage. Because of these factors, fisheries values were rated a "1".

Wildlife: 3, Substantial

Area within the river corridor provides high quality habitat for habitat for big game fawning and summer range. The stringer meadows area provides important wildlife habitat for several species. Habitat diversity provided by both meadow and surrounding forested area is very important. Area along the river contains some habitat suitable for the Northern Spotted Owl, a federally listed threatened species though some disturbance as a result of the sewer plant and associated road may have lowered habitat quality some. Based on the combination of the above factors, wildlife values were rated a "3".

Ecological/Botanical: 4, Outstandingly Remarkable

The stringer meadows complex is considered to be a very important meadow complex since it is one of very few true wet meadow complexes of that size and integrity in the region. Because of the importance of meadow complexes for wildlife habitat as well as the role they play in the hydrology of the area, the complex has been included on the EPA Region 10 Wetland Priority List identifying it as an important wetland. Because of this importance, ecological/botanical values were rated a "4".

Historical/Cultural: 2, Moderate

There are no known historic or prehistoric sites along the river within the segment. The Confederated Tribes of the Warm Springs Reservation have stated that the area along the river and especially the stringer meadows area is important to their history and traditional uses. This importance is considered to be of at least local and possibly regional importance. Because of this, historical/cultural values were rated a strong "2" for the segment.

Eligible: Yes

This is due to the ecological/botanical values being found outstandingly remarkable within the segment.

Potential Classification: Scenic

This is due to still largely primitive shoreline of river segment. There are roads within the river corridor but they are not visible for the majority of the segment. The presence of the sewer plant would not preclude the inclusion of the segment as Scenic since it is only one isolated structure along the segment.

Segment 3

From State Highway 35 immediately below Sahalie Falls to Forest boundary

Mileage: 13.4 miles

Free flowing: Yes

Scenic: 2, Moderate

River flows through a relatively broad valley bottom made up of glacial outwash before flowing into a narrower steep-sided canyon containing a number of cliffs. Vegetative pattern along the segment is relatively common in nature for the region. There are some rapids in the lower portion of the corridor while elsewhere the stream gradient is relatively low with few substantial water related features. There are places where long distance views of Mt. Hood, Bluegrass Ridge, and Elk Mountain can be seen as well as the steep cliff faces in the lower portion adding to the scenic quality of the corridor. There is some timber harvest in the upper portion of the corridor. This, as well as forest roads and State highway 35, with guardrails, riprap, and other associated structures have somewhat impacted the visual quality of the corridor. The combination of the above factors gave a rating of a "2" for the segment.

Recreational: 3, Substantial

Fishing is one of the primary recreational activities along the river, especially where access to the river is easier. Anglers are primarily local in nature but some come from the northern Willamette Valley and other surrounding areas. Steelhead and coho salmon are the primary anadromous species present. Rainbow trout are stocked in the river to help meet the heavy fishing pressure.

In winter, the upper portion of the river segment receives heavy Nordic ski use since the glacial outwash provides excellent terrain for ski trail development. A summer hiking trail provides access to the river for part of the segment. Use at this time is moderate to low but is increasing. Two campgrounds next to the river receive moderate use, primarily from local users with some campers coming from other places within the

region. Because use is primarily local in nature with some regional use, recreational values were rated a "3".

Geologic/Hydrologic: 3, Substantial

The river flows along the edge of a glacial outwash before entering the narrower canyon in the lower portion of the segment. Due to the nature of the outwash, there are numerous springs and small tributaries that flow into the river. While not extremely common, they can be found on many rivers throughout the region. While these features are not "textbook" examples of glacial outwash and associated hydrologic features, they still lend themselves to relatively easy viewing and interpretation. The lower canyon and associated cliffs can also be found in other locations throughout the region, but are still considered relatively unique. Based on the above, these values were rated a "3".

Fisheries: 2, Moderate

Habitat quality and productivity is considered moderate and fish species, both anadromous and native, are relatively common for the region. Fishing pressure is high and stocking with hatchery fish is necessary to supplement the native fishery. Due to the moderate habitat quality and productivity, fisheries values were rated a "2".

Wildlife: 3, Substantial

The area within the corridor, especially in the upper portion, provides very important habitat of high quality which meets the needs of big and small game. The area provides critical elk calving/deer fawning habitat and is part of a major migratory route for big game. Past timber harvest has broken up some contiguous habitat important for the Northern Spotted Owl, a federally listed threatened species. Harvest units do provide good habitat diversity for big game species. Within the lower portion of the segment, important habitat is very limited due to the steepness of the slopes within the canyon. While wildlife values are considered low in the lower portion of the corridor, importance of the upper section gives a rating of "3" for wildlife values for the segment.

Ecological/Botanical: 3, Substantial

In the upper corridor, the river and its immediate environment provides important riparian habitat in quantities greater than that usually found along other rivers throughout the region. This habitat if generally high in quality though some past management practices has lowered quality in specific locations. Important riparian habitat is very limited in the lower corridor due to canyon narrowness and presence of State Highway 35 and associated structures. The debris flow from Pollalie Creek removed most of the riparian vegetation for a distance of approximately 12 miles downstream off the Forest. This area now provides what is considered a locally important opportunity to observe early successional stages of riparian habitat. Because of the high incidence and quality of the riparian habitat in the upper segment and the opportunity to observe successional processes taking place in the lower segment, ecological/botanical values were rated a "3" for the segment.

Historical/Cultural: 2, Moderate

There is only one known historical site within the corridor. There is some potential for interpretation of the site, though past disturbance has impacted it's integrity. There is a high potential for other sites such as prehistoric hunting camps due to high wildlife use of the area. If sites such as this are found, they could provide insight as to the local history of the area. Based on the above, these values were rated a "2".

Eligible: Yes

While no one value was found to be outstandingly remarkable, it was felt that the combination of the recreation, geological/hydrological, wildlife, and ecological/botanical values all being rated as "substantial", was important enough to consider the segment as eligible.

Potential Classification: Recreational

A State Highway and other roads, 2 campgrounds, and timber harvest units are all visible from the river throughout the segment. Because of this, the segment would not qualify as a Wild or Scenic segment, thereby giving it a Recreational classification.

ZigZag River

Segment 1

From headwaters to Mt. Hood Wilderness boundary.

Mileage: 2.9 miles

Free flowing: Yes

Scenic: 3, Substantial

The river arises from the base of Zigzag Glacier at approximately the 5,000 foot elevation on Mt. Hood. The river flows steeply over mud and pyroclastic flows through a sparsely vegetated area in a narrow canyon. The canyon rim itself and beyond is fairly heavily

forested below timberline. There are two waterfalls within the segment adding to the diversity of the river. The combination of landscape elements can be found in some other locations throughout the region though it is still relatively unique. Views from the river up towards the top of Mt. Hood are considered exceptional and the complete lack of human alteration contribute favorably to visual quality. The combination of the above values rated a strong "3".

Recreational: 2, Moderate

Recreational use is light for most of the segment as access is very limited. There is heavy use on the upper end of the segment where the Pacific Crest National Scenic Trail crosses the river and Paradise Park is located adjacent to the corridor. The river itself does not draw visitors to the area but it does add to the recreation experience of those using the area. Development of additional recreational or interpretive opportunities is limited. Because of the limited use and river related opportunities, recreational values were rated a "2".

Geologic/Hydrologic: 3, Substantial

From the headwaters down, the river flows through bouldery mud and pyroclastic flows. In the lower portion of the segment, there is an abundance of loose sand and gravel from the weathered mudflows above. Because of the erodible nature of this material, a steep walled, narrow canyon has developed as the river cuts through the mudflows. There are also intrusive rocks within the corridor which are responsible for structures such as the two waterfalls found in the segment. This type of geology is found on other volcanic peaks throughout the region as well as other locations on Mt. Hood, but is limited essentially to the higher elevations of those peaks, making it relatively unique in comparison to other rivers in the region. The river itself is glacial in origin and has a relatively even flow throughout the year, though it varies some during spring runoff and rainfall events. This type of flow regimen is relatively common throughout the region. Based on the relative uniqueness of the geology of the river, these values were rated a "3" for the segment.

Fisheries: 2, Moderate

Resident cutthroat trout, a relatively common species in the region, are found in the lower portions of the segment. Habitat quality is considered moderate. Based on these factors, fisheries values were rated a "2" for the segment.

Wildlife: 2, Moderate

Wildlife species that are found within the corridor are relatively common throughout the region. There are no known T & E species within the corridor and suitable habitat for species is very limited. Habitat is undisturbed for most of the corridor except minor disturbances in the upper portion of the segment where the Pacific Crest Trail crosses the river. Habitat quality is considered moderate due to limited cover and young age of the vegetation along the river. Based on these factors, wildlife values were rated a "2" for the segment.

Ecological/Botanical: 2, Moderate

There are no known sensitive plants along the river and suitable habitat is very limited. River corridor does provide a good undisturbed example of a high alpine ecosystem, with examples of younger successional stages evident on the mudflow. The type of ecosystems found are relatively common for the volcanic peaks throughout the region. Based on these factors, ecological/botanical factors were rated a "2" for the segment.

Historical/Cultural: 2, Moderate

The Timberline trail, which is currently being nominated for the National Register of Historic Sites crosses the river near the upper end of the segment. Within the corridor, there are no other known historic or prehistoric sites and potential is considered to be low for additional sites. Based on the fact that there is one type of site within the river corridor that is important to local history, historical/cultural values were rated a "2" for the segment.

Eligible: No

This determination is based on the fact that no values were found to be remarkable within the segment.

Segment 2

From Mt. Hood Wilderness boundary to confluence with Sandy River

Mileage: 9.0 miles

Free flowing: Yes

There are some riprap and gabion structures along the banks of the river to reduce erosion potential during high water events. For most of the length of the segment, however, bank is natural in appearance.

Scenic: 2, Moderate

River flows through fairly gentle, broad valley with minimal diversity in the way of land and rock forms. The stream does have some good riffles and pools which is pleasing but relatively common. The vegetation pattern is also common for the length of the corridor. There are few photographic attractions within the segment. Recreational residences along the shoreline, several bridges crossing the river within the segment, the community of Rhododendron, as well as some gabions and riprap along the shore tend to cause some minor reduction of visual quality as viewed from the river. The combination of the above factors gave a rating of "2" for scenic values in the segment.

Recreational: 3, Substantial

There are several recreational residences along the river which receive use primarily in the non-winter months. Owners are primarily from the Portland area though some come from other areas of Oregon and Washington. A campground in the lower portion of the segment is used primarily by local and Portland metropolitan residents. The river receives fairly heavy fishing use by local and some regional anglers fishing for a variety of anadromous fish as well as resident cutthroat. Because use is primarily local in nature with some recreationists coming from around the region, recreational values were rated a "3" for the segment.

Geologic/Hydrologic: 3, Substantial

The broad valley the river flows through is an old mudflow created by a past eruptive event from Mt. Hood. Mudflows of the size and make-up of this one can be found in other places throughout the region but are still relatively unique. Hydrologic features along the river are relatively common in comparison to other rivers throughout the region. Based on the relative uniqueness of the mudflow, these values were rated a "3" for the segment.

Fisheries: 3, Substantial

The river segment is considered to be a very good anadromous fishery that includes spring chinook and coho salmon, and summer and winter steelhead. River habitat quality is considered to be high for most of the segment. This combination of species and habitat quality can be found elsewhere in the region yet is still relatively unique. There are also resident cutthroat trout in the segment which are relatively common throughout the region. Because of the relative uniqueness of the anadromous fishery coupled with the quality of habitat, fisheries values were rated a "3" for the segment.

Wildlife: 2, Moderate

The lower portion of the corridor provides some winter range for big game species such as black tailed deer. There is some habitat for the Northern Spotted Owl, a federally listed threatened species, but the amount of habitat is limited due to younger aged stands and other development within the area. Other wildlife species in the area are common throughout the region. The presence of residences along much of the river reduces the amount and quality of the existing habitat. Based on the above, wildlife values were rated a "2" for the segment.

Ecological/Botanical: 2, Moderate

There are no known sensitive plants within the corridor, though the possibility of suitable habitat for Corydalis aquae-gelidae exists. Future surveys of the area may find the presence of the plant. The main plant communities found within the corridor are considered to be common and can be found throughout the region. Because of the potential of suitable habitat for the Corydalis, these values were rated a "2" for the segment.

Historical/Cultural: 4, Outstandingly Remarkable

There are numerous types of historical sites within the river corridor. They include the Barlow Road which was the last overland link of the Oregon Trail. This is a trail of national importance and is already receiving interpretation in places next to the river. There are also a number of structures and two campgrounds built in the early 1930's as part of the Civilian Conservation Corps programs. The Zigzag Ranger Station was built in 1909 and is still being used by the Forest Service for offices. There are also indications of prehistoric use of the area by native Americans. Because of the abundance of different types of historical/ cultural sites within the corridor as well as the national importance of the Barlow Road, these values were rated a "4" for the segment.

Eligible: Yes

This determination is based on the outstandingly remarkable historical values found within the river corridor.

***Potential Classification:* Recreational**

This classification is based on the presence of several residences, campgrounds, bridges, and the town of Rhododendron along the river. Because of the level of development along the river, as well as the presence of riprap and gabion structures, the river would not qualify for either the Wild or Scenic classifications.

Eagle Creek

Segment 1

From headwaters to W. Sec Line, Sec 20, T3S, R6E

Mileage: 7.2 miles

Free flowing: Yes

Scenic: 2, Moderate

The creek begins in a cirque shape headwater area flowing then through a steeply sloped "V" shaped valley that is heavily forested with older aged Douglas-fir and hemlock. The creek contains some riffles, with numerous downed logs and pools which is visually pleasing but is relatively common for many streams throughout the region. The presence of large, old trees adds to the visual character of the river. Long range views and photo opportunities are very limited due to density of forest along the river and adjacent trail. The lack of human alterations along the segment does contribute favorably to visual quality along the river. The combination of the above gave scenic values a strong "2" rating for the segment.

Recreational: 3, Substantial

Recreational uses along the river include angling, dispersed camping by both equestrians and hikers, and day hiking in the lower portions of the segment. Users are primarily local in nature, but there is some use by recreationists from around the region, especially for equestrians. There is one dispersed camping area within the segment that was originally developed as an equestrian camp and is still used for that purpose. Angling opportunities are very good for resident cutthroat and rainbow trout. The above opportunities are available along other rivers throughout the region, but this combination is considered relatively unique, giving a rating of "3" for recreational values in the segment.

Geologic/Hydrologic: 2, Moderate

The creek starts in a cirque shaped headwaters and flows through a steeply sloped "V" shaped canyon. Bedrock material is volcanic in nature which is common throughout the central cascades. There is the presence of alluvial fans at the base of side drainages flowing into the creek. There are a few rock outcroppings along the corridor. While the above features may not be found along all rivers throughout the region, they are still considered to be relatively common. Hydrologic features also are considered to be relatively common. Because of this, these values were given a rating of a "2" for the segment.

Fisheries: 4, Outstandingly Remarkable

Fishery habitat quality is considered to be prime within the segment. The area is in a pristine condition with high habitat diversity and high water quality. Stream productivity is also high. There are very few places within the region where this combination of qualities exist, and because of this, fishery values were rated a "4" for the segment.

Wildlife: 4, Outstandingly Remarkable

The forest along the creek consists primarily of an undisturbed, older aged, Douglas-fir and hemlock multistoried stand that provides prime quality habitat for the Northern Spotted Owl, a Federally listed threatened wildlife species. Owls are known to be nesting in the area. There is also high quality riparian habitat along the creek edge that meets many needs of big and small game species in the area. The lower end of the corridor also provides key winter range for big game species. Because of the superior quality of the habitat suitable for a variety of wildlife species, these values were rated a "4" for the segment.

Ecological/Botanical: 2, Moderate

The river corridor provides some limited suitable habitat for Corydalis aquae-gelidae, a known candidate threatened species. None has been found at this time along the river but this may be due to lack of surveys in the area. It has been found in isolated locations outside the corridor in tributaries to the creek. Based on the presence of some limited suitable habitat, ecological/botanical values were rated "2" for the segment.

Historical/Cultural: 2, Moderate

The upper Eagle Creek area is suspected to have a Native American trail that is thought to be a major east/west transportation route. In the lower end of the corridor, there is the remains of a cabin that is thought to have been used in the 1920-30's and is in fair condition. Both of these sites are considered to have importance for interpreting local prehistory/ history. Because of this, historical/cultural values were rated a "2" for the segment.

Eligible: Yes

This determination is based on fisheries and wildlife values being found outstandingly remarkable within the segment.

Potential Classification: Wild

This classification is based on the fact that the area along the river is very primitive in nature, is accessible only by trail, and the waters are considered unpolluted. Because of this, it meets all the requirements of a wild classification.

Segment 2

From W. Sec Line, Sec 20, T3S, R6E, to Forest boundary

Mileage: 1.1 miles

Free flowing: Yes

Scenic: 2, Moderate

Creek flows through a steeply sloped "V" shaped valley that is heavily forested with some older aged Douglas-fir, hemlock, and cedar adjacent to the creek. Vegetative diversity is considered to be moderate. Creek contains some riffles, as well as several downed logs and pools which is visually pleasing though relatively common for many rivers throughout the region. Long range views and photo opportunities are very limited from the river itself but some are present from the low standard road/trail going to the river where it passes through timber harvest units. The quality of these opportunities is reduced by the evidence of harvest activities. Overall, the evidence of harvest activities within the corridor somewhat tends to reduce visual quality. Based on the above, scenic values were rated a "2" for the segment.

Recreational: 2, Moderate

Most recreation use within the segment is primarily by hikers and equestrians passing through to go to the upper reaches of the river. There is some angling that takes place in the creek almost exclusively by local users. Other dispersed recreational opportunities are very limited within the segment. Based on these factors, recreational values were rated a "2".

Geologic/Hydrologic: 2, Moderate

Creek flows through a steeply sloped "V" shaped canyon. Bedrock material is volcanic in nature. There are some alluvial fans at the base of side drainages flowing into the creek. There are some minor rock outcroppings along the river. While the above features may not be found along all rivers throughout the region, they are still considered to be relatively common. Hydrologic features are also considered to be relatively common. Because of this, these values were given a rating of a "2" for the segment.

Fisheries: 4, Outstandingly Remarkable

The creek itself has not been disturbed by past management activities and provides prime quality habitat for resident fish species. Productivity is high, water quality is high, and the potential for maintaining this habitat quality is good. Because there are very few places within the region with undisturbed habitat of this quality, fishery values were rated a "4" for the segment.

Wildlife: 3, Substantial

The forest along the creek in this segment contains older aged Douglas-fir, hemlock, and cedar stands that do provide some good quality habitat for the Northern Spotted Owl, a federally listed threatened species. The owls are known to be present in the area. There have been some harvest activities in the past which has lowered the continuity and quality of important owl habitat within the corridor. There is some good quality riparian habitat along the creek edge which meets the needs of a variety of species in the area. The corridor also provides key winter range for big game species. Based on the above factors, wildlife values were rated a "3" for the segment.

Ecological/Botanical: 2, Moderate

There is some limited suitable habitat for Corydalis aquae-gelidae, a known candidate threatened species. None has been found at this time but this may be due to lack of surveys in the area in the past. Based on the availability of limited suitable habitat for the species, ecological/ botanical values were rated a "2" for the segment.

Historical/Cultural: 1, Low

The river corridor is suspected to have been used in the past as an east/ west transportation route but evidence is very limited in this segment. There is additional evidence of this type of past use in the upper segment of the creek. There are no other known sites within the corridor though there may have been some transitory use by early homesteaders and explorers. Because the importance of the transportation route for interpreting local prehistory, historical/cultural values were rated a "2" for the segment.

Eligible: Yes

This is based on the outstandingly remarkable fishery habitat values within the segment.

Potential Classification: Recreational

This classification is based on the fact that the presence of a low standard road and timber harvest units do show substantial evidence of human activity within the cor-

ridor, impacting the natural appearance of the river's environment. Because of that impact, the river does not qualify as either Wild or Scenic, thereby giving the Recreational classification.

North Fork Clackamas River

Segment 1

From Headwaters To N. Sec Line, Sec 17, T4S, R5E

This segment is part of a designated Oregon State Scenic Waterway.

Mileage: 10.8 miles

Free flowing: Yes

Scenic: 2, Moderate

River flows through a broad canyon with moderately steep slopes. Vegetation is generally a homogeneous, younger aged timber stand with little harvest along the river. There are some cliffs and rock outcroppings along the river segment but their presence is not throughout the segment. Overall, the combination of the landscape elements are relatively common to the region, is pleasing to the viewer but not highly memorable. Opportunities for views and photo attractions are low. Human alterations have not reduced the overall visual quality. The combination of the above elements gave a rating of "2" for the segment.

Recreational: 2, Moderate

There are some limited existing opportunities for dispersed recreation activities such as camping and fishing. Most of the use is local in nature. Because of these factors, recreation values were rated a "2".

Geologic/Hydrologic: 2, Moderate

There are some cliffs and rock outcroppings along the river which are relatively common throughout the region but may not be found on all rivers. Other geologic and hydrologic features along the river would be considered common to the region in relation to other rivers. Because of the presence of rock outcroppings and cliffs, these values were given a rating of "2".

Fisheries: 4, Outstandingly Remarkable

River overall provides habitat of a moderate quality for fisheries. There is a waterfall 0.7 miles up from the lower end of the segment that blocks anadromous fish passage. The small population of resident cutthroat and rainbow trout above the falls is relatively common for rivers throughout the region. Below the falls, there is the presence of a late winter run coho that is a rare native stock of salmon. This stock was originally found throughout the Columbia River drainage but is now limited only to the Clackamas River and its tributaries. Because of the presence and importance of this species in the segment, fisheries values were rated a "4".

Wildlife: 2, Moderate

The area around the river provides some pockets of old growth type habitat important to the Northern Spotted Owl, a federally listed threatened species. These pockets are isolated and do not meet all the biological needs of the species. The majority of the area is a mostly homogeneous younger-aged stand that is relatively common throughout the region. Because of limited availability of suitable habitat to meet the needs of the Northern Spotted Owl, wildlife values were rated a "2" for the segment.

Ecological/Botanical: 2, Moderate

There is potential habitat for a sensitive plant, Chorydalis aquae-gelidae, along the river. Extensive surveys for the plant have not been done so it is currently unknown if it is present in the river corridor. Other plant communities along the river are relatively common in comparison to other rivers throughout the region. Because of the potential habitat for the sensitive plant, these values were rated a "2"

Historical/Cultural: 3, Substantial

There are two historical sites, a lookout and a miners cabin, that are in very good shape and have good interpretation potential located within the corridor. There are also some other types of historic and prehistoric sites within the corridor but those sites have been disturbed and their potential for interpretation is low. Based on the above, these values were rated a strong "3".

Eligible: Yes

This segment was found eligible based on fisheries values being outstandingly remarkable with the presence of the late run coho salmon.

Potential Classification: Scenic

This classification is based on the fact that the segment does have road access to it making it ineligible for a Wild classification. The shoreline still remains largely undeveloped without substantial evidence of human activity within the corridor, thereby meeting the requirements of the Scenic classification.

Segment 2

From N. Sec Line, Sec 17, T4S, R5E, to slackwater, North Fork Reservoir

This segment is part of a designated Oregon State Scenic Waterway.

Mileage: 2.7 miles

Free flowing: Yes. The entire segment is in private ownership.

Scenic: 1, Low

The area the river flows through is located on private land and has been heavily impacted by timber harvest activities throughout much of the corridor. Landscape elements are considered common for the region and opportunities for views and photo attractions is considered to be low. The impacts of the timber harvest have greatly reduced the overall visual quality along the river in this segment. The combination of the above elements gave a rating of "1" for scenic values for the segment.

Recreational: 1, Low

With the entire segment in private ownership, public access to the river is very limited, thereby limiting recreation opportunities in the area. The landscape alteration from timber harvest also significantly reduces the recreation experience of users within corridor. Because of the above factors, recreational values were rated a "1" for the segment.

Geologic/Hydrologic: 1, Low

River canyon is a broad canyon with geologic features that are common throughout the region. There are no known significant geologic or hydrologic features within the corridor. Based on the above, geologic/ hydrologic values were rated a "1" for the segment.

Fisheries: 4, Outstandingly Remarkable

Throughout the entire segment, there is a presence of a late winter run coho that is a rare native stock of salmon. This stock was originally found throughout the Columbia River drainage but is now limited only to the Clackamas River drainage. Because of the presence of the stock in this segment and its importance, fishery values were rated a "4".

Wildlife: 1, Low

Due to timber harvest activities and fires that have happened in the past, there is little suitable habitat that meets the needs of any T & E species. There is some riparian habitat along the river, but amounts of this type is limited. Because of the large size of the harvest unit along the river, habitat diversity for big game species is also very limited. Based on the above factors, wildlife values were rated a "1" for the segment.

Ecological/Botanical: 1, Low

Within the segment, habitat has been heavily altered and there is very limited suitable habitat for any sensitive plant species such as Corydalis aquae-gelidae. There are no known species within the corridor. Based on the above, ecological/botanical values were rated a "1" for the segment.

Historical/Cultural: 1, Low

There are no known surveys of the area within the corridor. There is moderate potential for historical/cultural sites being found within the area. If there are sites within the corridor, the possibility is high that they would have been disturbed by harvest activities and their integrity is low. Based on the above factors, these values were rated a "1" for the segment.

Eligible: Yes

This segment was found eligible based on the fisheries values being outstandingly remarkable with the presence of the late run coho salmon.

Potential Classification: Recreational

The above determination is based on the high level of management activities along both sides of the river for the major part of the segment. Because of the past management activities, the segment would not qualify as Wild or Scenic, thereby giving the classification of Recreational for the segment.

South Fork Clackamas River

Segment 1

From headwaters to confluence of mainstem with E. Fk. of S. Fk. Clackamas

Mileage: 4.2 miles

Free flowing: Yes

Scenic: 1, Low

Landscape elements for segment are considered common for region. Area is heavily altered by timber harvest significantly reducing visual quality and opportunities for views and photo attraction. Based on the

above factors, Scenic qualities were rated a "1" for the segment.

Recreational: 1, Low

Due to impacts from intensive timber harvest within the corridor, recreation opportunities along the river are very limited, giving a rating of "1" for recreational values.

Geologic/Hydrologic: 1, Low

River flows through a relatively narrow "V" shaped canyon with a few rock outcroppings along the river. There are no other significant geologic/ hydrologic features found within the segment. Features are considered common in comparison to other rivers within the region. Because of this, these values were rated a "1".

Fisheries: 2, Moderate

Habitat found in river is of moderate quality with a small population of resident rainbow and cutthroat trout in the river. Fishery productivity is low. Good water quality is important to downstream fishery values. Because of the combination of the above, fisheries values were rated a "2".

Wildlife: 1, Low

Area along river provides low quality habitat for big game species due to lack of vegetative diversity and hiding and thermal cover. There is very little, if any, suitable habitat for any T & E wildlife species. While there is a large amount of forage for big game species, little is utilized due to lack of cover. Because of the poor quality habitat, wildlife values were rated a "1" for the segment.

Ecological/Botanical: 1, Low

Suitable habitat for any significant plant communities is very limited due to disturbance by past management activities along the river. The existing reforested land along the river is common to other areas throughout the region. There are no known sensitive plants along this segment of the river. Based on the above, these values were rated a "1" for the segment.

Historical/Cultural: 1, Low

There are no known sites within the corridor. For unknown sites that were within the corridor, there is a high likelihood that they were disturbed during timber harvest activities, reducing their integrity. Because of the above, these values were rated a "1" for the segment.

Eligible: No

The segment was not found eligible since there were no outstandingly remarkable values found within the segment.

Segment 2

From confluence of river with E. Fk of S. Fk Clackamas to confluence with Clackamas mainstem

The majority of the segment is also part of a designated Oregon State Scenic Waterway

Mileage: 4.2 miles

Free flowing: Yes

Scenic: 2, Moderate

The river flows through a narrow, well dissected canyon that has large rock outcrops and cliffs present. A 100 foot water fall in the lower part of the segment and some old growth trees along the river also add to the visual diversity. Some timber harvest units within the corridor at both ends of the segment as well as the former Oregon City waterworks at the lower end of the segment reduce the visual quality somewhat. Opportunities for long range views and photo attractions is limited due to the narrowness of the canyon and existing vegetation. The combination of the above factors gave a scenic value of "2" for the segment.

Recreational: 2, Moderate

Recreation use along the segment is very low due to limited access to the area and minimal opportunity to develop new recreation facilities. Current use is limited to hiking to the river on an existing trail. Use is almost exclusively by local anglers. Fishing quality in not considered high so fishing pressure is low. Recent designation as a State Scenic waterway may increase use of area because of the additional focus on the area. Opportunities to develop new facilities is limited due to topography and limited access across private land, especially in lower portion of segment. Since use is primarily local in nature and opportunities are relatively common throughout the region, recreational values were rated a "2" for the segment.

Geologic/Hydrologic: 2, Moderate

There is a 100 foot water fall in the lower portion of the segment at river mile 0.7 as well as some large rock outcroppings along the river. These features can be found in other locations throughout the region but are not considered common for all rivers. There are no other significant hydrologic or geologic features found within the

corridor. Based on the above, these values were rated a "2" for the segment.

Fisheries: 4, Outstandingly Remarkable

River overall provides moderate to low quality habitat for resident fisheries. There is a small resident rainbow and cutthroat trout population above the falls. Below the falls, spring chinook, winter and summer steelhead, fall run coho, and a late winter run coho are found. The winter coho are a rare native stock of salmon originally found throughout the Columbia River drainage but is now limited to the Clackamas River and its tributaries. Because of the presence of this species and its importance, these values were rated a "4" for the segment.

Wildlife: 2, Moderate

The river area and corridor does provide some habitat to meet the needs of the Northern Spotted Owl, federally listed threatened species. The amount of the habitat is limited due to limited size and quality of the suitable habitat. There are also some important riparian areas along the river but they too are limited in size and distribution. Vegetation generally is relatively homogeneous younger aged stand with limited diversity to meet needs of big game species. Based on the above, wildlife values were rated a "2".

Ecological/Botanical: 2, Moderate

Few surveys for sensitive plant species have been done in the area but there has been one plant, Choryadalis aquae-geldae, a potential sensitive species, found at isolated locations within the corridor. There is some additional areas where the plant may be found, but these areas are relatively isolated. Due to the isolated nature of suitable habitat, these values were given a rating of "2" for the segment.

Historical/Cultural: 2, Moderate

The old Oregon City Waterworks located near the mouth of the river was once used as a water diversion for drinking water for Oregon City. This historical structure is still in good, interpretable condition. There is also one known prehistoric site within the corridor. The corridor has not been surveyed extensively for additional sites. Potential for additional sites is considered to be low due to difficult access in the past as well as fish runs being limited to the lower 0.7 miles which would limit the range of prehistoric fishing parties. Based on the above factors, these values were given a rating of "2" for the segment.

Eligible: Yes

This determination is based on fishery values being considered outstandingly remarkable due to the presence of the late winter coho salmon in the segment.

Potential Classification: Scenic

This classification is based on the fact that the corridor contains timber harvest units at each end of the segment and that there is road access into the segment, thereby making it ineligible for the "Wild" classification. The shoreline still remains largely undeveloped for the length of the segment, thereby meeting the requirements of the "Scenic" classification.

Fish Creek

The river section evaluated flows from its headwaters to its confluence with the Clackamas River.

Mileage: 13.5 miles

Free flowing: Yes

Scenic: 2, Moderate.

River flows through a narrow canyon near the headwaters into broader canyon as it nears confluence with Clackamas. There is timber harvesting within the corridor along length of the canyon which is visible from the creek and adjacent road. The area immediately adjacent to the creek is protected for scenic viewing and streamside protection along the lower 3 miles. The cliffs which add visual diversity to the corridor are found in other locations throughout the region but are not common to all rivers. Views and photo attractions are considered low and human alterations cause some reduction in the visual quality, especially in the upper portion of the drainage. Based on the above, scenic values were rated a "2".

Recreational: 3, Substantial

River receives heavy dispersed recreational use such as camping and fishing with most users coming from local surrounding communities and the Portland metropolitan area. There is some use by recreationists from elsewhere in the region. Fishing pressure is high along the river and fish planting is done to help meet the demand and compensate for the current low quality fish habitat. There is a strong potential for interpretation of fish habitat improvement work along the creek that could draw local and some occasional regional based users.

Based on the primarily local with some regional use, recreational values were rated a "3" for the segment.

Geologic/Hydrologic: 2, Moderate

River flows through a narrow steep sided canyon for most of its length. There are a number of cliffs along the river which is found along many but not all river canyons in the Cascades. Other geologic and hydrologic features are common in comparison to other rivers in the region. Since features are of a type that they are found in most but not all river canyons in the Cascades, geologic/hydrologic features were rated a "2" for the segment.

Fisheries: 4, Outstandingly Remarkable

River is very important as potential anadromous fishing habitat. River once provided excellent habitat but due to past management practices and flooding, habitat quality has declined. Potential for restoration of the habitat is high and an ambitious restoration project by the Forest Service is taking place. The results of the restoration project are the subject of a nationally important research effort.

River contains spring chinook, winter and summer steelhead, and winter run coho salmon. The late winter run coho salmon is a rare native stock of salmon and is currently being considered as a candidate threatened and endangered species. The nationally important scientific study on habitat improvement and the presence of the late running coho are important enough to give the rating of "4" to fishery values in the segment.

Wildlife: 2, Moderate

The river area and corridor does provide some habitat to meet the needs of the Northern Spotted Owl, a federally listed threatened species, but past timber harvesting has broken up the habitat enough to where it does not meet all the needs of the species. Presence of cutting units within the river corridor does provide high habitat diversity and winter range for big game species, but this type habitat is common throughout the region. Because of the limited availability of suitable habitat to meet the needs of the Northern Spotted Owl, wildlife values were rated a "2" for the segment.

Ecological/Botanical: 2, Moderate

One sensitive plant, Aster gormanii, has been located in the drainage. It is found in relatively isolated pockets and suitable habitat for the species is limited. Because of the limited suitable habitat, these values were given a rating of a "2" for the segment.

Historical/Cultural: 1, Low

The drainage has been surveyed in conjunction with past timber sales and evidence of an old cabin site and transient Native American fishing camps has been found. All sites found have been disturbed in the past and site integrity is very low thereby giving the rating of "1".

Eligible: Yes

This is based on fisheries values being found outstandingly remarkable.

Potential Classification: Recreational

The above rating is based on the presence of a road adjacent to and visible from the creek for most of its length and the presence of several timber harvest units within the corridor. Because of this, the segment would not qualify as a Wild or Scenic segment, thereby giving it a Recreational classification.

South Fork Roaring River

The river section evaluated flows from its headwaters to the confluence with the Roaring River.

Mileage: 4.6 miles

Free flowing: Yes

Scenic: 3, Substantial

The river flows through a narrow, deeply incised canyon which has large rock outcroppings and cliffs along portions of the canyon. Old growth trees are predominant along the river and the river itself flows over numerous cascades and through several pools. Long range views are limited from the narrow canyon due to screening but combination of landscape elements are considered memorable and provide good photo opportunities. There are no human alterations at this time as viewed from the river. The combination of the above gave scenic values a rating of a strong "3".

Recreational: 3, Substantial

Because of difficult access, recreation use is very low along the river. Trails are along the ridges above the river, but none cross the river at this time. This provides a very primitive, relatively high risk recreation experience. Opportunities for this type of experience is quite limited on the Mt. Hood and possibly adjoining Forests. Experiences like this can be found in some other locations within the region. Because of the rela-

tive uniqueness of the recreation opportunities, recreational values were rated a strong "3".

Geologic/Hydrologic: 3, Substantial

The river corridor has large rock outcroppings and cliffs along the river canyon along with a number of bedrock faces on the sides of pools along the river. Due to the steep gradient of the river, several cascades as well as some 10' to 20' waterfalls are along the river. The combination of these features is considered to be relatively unique for the region, therefore giving a rating of "3" for geologic/hydrologic values.

Fisheries: 3, Substantial

Due to the remoteness and lack of past management in the area, the river is an example of a very pristine, unmodified habitat. This type of habitat may be found in some locations throughout the region, but overall is quite limited. Anadromous fish are not present in the river due to an impassable falls on the mainstem of the Roaring below the river's mouth. Native cutthroat trout are present on the river. Because of the relative uniqueness of the habitat, fisheries values were rated a "3".

Wildlife: 4, Outstandingly Remarkable

The area within the corridor provides prime quality habitat for the Northern Spotted Owl, federally listed threatened species. Owls are known to nest there. With almost no development in the area within and around the corridor, habitat quality is considered excellent. Because of this, wildlife values were rated a "4".

Ecological/Botanical: 3, Substantial

There is some potential habitat for federally listed or candidate T & E plant species such as Corydalis aquaegelidae, though with no surveys of the area, it is not known if the species exist in the river corridor. The vegetative communities within the entire drainage are excellent examples of older-aged climax communities. They are also in an undisturbed condition. Both of these characteristics can be found within some other drainages within the region, yet they are still considered relatively uncommon. Based on the relative uniqueness of the vegetative communities and their condition, ecological/botanical values were rated a "3".

Historical/Cultural: 1, Low

There are no known sites along the river but this could be due to the fact that there have been no known surveys in the area. There may have been some transient use of people passing through the area. Due to difficult access, and the fact that the river is not on a major known travel route, potential for important cultural sites is considered low. Because of this, historical/cultural values were rated "1".

Eligible: Yes

This is due to outstandingly remarkable wildlife values along the river.

Potential Classification: Wild

The river is in a primitive condition throughout the entire length and there is no road access to the river. The waters of the river meet state standards for contact recreation and is therefore considered "unpolluted" as per the guidelines for classification of Wild and Scenic Rivers. Based on the above factors, the river meets the criteria for, and is therefore classified as "Wild" for its length.

Oak Grove Fork Clackamas River

Segment 1

From Timothy Lake Dam to the slackwater at Harriet Lake

Mileage: 10.0 miles

Free flowing: Yes

There is an approved and licensed hydroelectric project that would divert some of the water from Stone Creek below Timothy Lake dam. The water would then be returned to the river downstream approximately 5.6 miles after passing through a hydroelectric generator. A similar project would divert water from Shellrock Creek, returning the water to river near the confluence of Shellrock Creek and the Oak Grove Fork. Mitigation measures set forth for the project would continue to maintain minimum flows for the river to protect fishery and botanical values. The Federal Energy Regulatory Commission (FERC) has issued a license for the proposed Stone Creek/Shellrock Creek hydroelectric project. (FERC Project Number 5264)

Scenic: 2, Moderate

For most of the segment the river flows through a relatively narrow, well dissected river valley with a few smaller rock outcroppings within the corridor. The vegetation pattern and visual character of the river and riparian area are relatively common for the region, though not found among all rivers. There are some large, old stands of timber adjacent to the river and

parallel road which contribute to the scenic quality of the corridor. There are timber harvest units visible from both the river and the road, reducing the visual quality somewhat. There are few outstanding views or photo attractions along the river itself. Based on the above factors, scenic values were given a rating of "2".

Recreational: 2, Moderate

Recreation use is primarily as a travel route to and from Timothy Lake, with some additional use occurring as dispersed camping along the river. Users are primarily from the local commuting area. Since use is essentially local, recreational values were rated a "2".

Geologic/Hydrologic: 1, Low

River flows through a relatively narrow, well dissected river canyon. No major outcrops, cliffs, or other remarkable geologic features are found within the corridor. Hydrologic features found within the river are considered common in relation to other rivers within the region. Because of the commonality of the features in the corridor, these values are given a rating of "1" for the segment.

Fisheries: 2, Moderate

A wild population of cutthroat trout comprises the majority of the resident fishery, with rainbow, brown and brook trout also occurring in the river, probably introduced from Timothy Lake. Habitat quality is considered moderate and species are relatively common in comparison to other rivers within the region. There is no anadromous fishery within the river segment since Harriet Lake Dam blocks access for anadromous fish in this river segment. Based on the above, fishery values were rated a "2" for the segment.

Wildlife: 3, Substantial

Along the upper portion of the river corridor, there is an area of habitat suitable for the Northern Spotted Owl, a federally listed threatened species. This suitable habitat is broken up some by the presence of harvest units and the road adjacent to the river so it is not considered prime quality habitat. Bald Eagles have been seen within the corridor, although there are no known nests. There are ospreys nesting in the extreme upper end of the corridor. It is thought that the eagle and osprey are feeding in the Timothy Lake area. Based on the combination of the above factors, wildlife values within the segment were rated a "3".

Ecological/Botanical: 4, Outstandingly Remarkable

The river corridor is known to have the largest recorded concentration of Corydalis aquae-gelidae, a federal candidate species for listing as a Threatened plant. The plant is currently described as "sensitive." Because this is the largest recorded concentration of this plant, Ecological/Botanical values were rated a "4" for the segment. The mitigation measures for the proposed hydroelectric project described above are designed to protect the presence of the plant.

Historical/Cultural: 1, Low

The river corridor may have been a prehistoric travel route. Portions of the corridor have been surveyed and no sites having regional or national importance have been found within the segment. For the portions not yet surveyed, the probability of finding sites with regional or national importance is considered to be low. Based on the above, historical/ cultural values were rated a "1" for the segment.

Eligible: Yes

This determination is based on the outstandingly remarkable rating for ecological/botanical values.

Potential Classification: Recreational

There are a number of timber sale units throughout the segment which are visible from both the road adjacent to the river, and the river itself. The road itself is also visible from the river in a number of locations. Based on these factors, it was determined that the river was not eligible for either the Wild or Scenic classifications, thereby qualifying the river for the Recreational classification.

Segment 2

From bottom of Harriet Lake Dam to confluence with Clackamas

Mileage: 5.2 miles

Free flowing: River is not considered free flowing since there are times of the year when all the water from the river is diverted to the Three Lynx Powerhouse. During this time the only water in the river bed is due to minor leakage from the rock fill dam. While there is some flow over the top of the dam during times of very high water flow such as runoff immediately following spring rain storms over snow, these events do not happen that often or for extended periods of the year. The flows that are present below the dam are so low that it was

determined that they are not riverine in character and did not qualify as free flowing.

Eligible: No

This is based on the fact that the river is not considered free flowing.

Collawash River

Segment 1

From headwaters to Buckeye Creek

Mileage: 11.0 miles

Free flowing: Yes

Scenic: 3, Substantial

River flows through a narrow, steeply sloped, well dissected canyon that contains several cliffs and talus slopes throughout the segment. The river flows over and around many rocks, through pools, and over one waterfall approximately 20 feet high. There are also some broader flood plains within the segment. The vegetative pattern is considered relatively common for the region. While there are few, if any long distance views from the canyon, the combination of cliffs and the river with its large rocks, pools and cascades provides substantial photo opportunities. There are a few timber harvest units visible places along the river, but overall appearance along the segment is a natural forested setting. The combination of the above factors gave the scenic values a rating of "3"

Recreational: 3, Substantial

Recreational use within the corridor is primarily dispersed in nature such as camping, hiking, and fishing. Users are primarily local in nature but there are some users from other places within the state who use the area. The area does have good potential for additional development to meet the needs of the recreationist. Because some of the use in the area is from users outside the local area, recreational values were rated a "3".

Geologic/Hydrologic: 2, Moderate

The river is within a narrow canyon with a number of cliffs along the canyon walls. There is one steep cascade approximately 20 feet high within the segment. There are also some wide flood plains in places along the river. There are no other unique geologic or hydrologic features found within the segment. The combination of the above can be found within several other rivers within the region, but is not common to all. Because of this, these values were rated a 2 for the segment.

Fisheries: 4, Outstandingly Remarkable

The river provides excellent spawning habitat for anadromous fish throughout the segment. The steep cascade area located in the lower portion of the segment acts as a partial barrier for most anadromous fish, though some have been known to migrate beyond it. The channel in this area has been modified to facilitate fish passage to the abundant spawning habitat in the upper portion of the segment. Rainbow trout is the major resident species of the river. Spring chinook, winter and summer steelhead, and winter run coho are found within the lower end of the segment. The winter run coho is a rare native stock of salmon once found throughout the Columbia River basin, but is now limited to the Clackamas river drainage. This stock has been known to migrate above the falls. Due to excellent habitat quality throughout the segment and the presence and importance of the coho, fisheries values were rated a "4" for the segment.

Wildlife: 2, Moderate

Along the river are several high quality riparian habitat areas that are important to a number of wildlife species. There is limited habitat that would meet some of the needs of the Northern Spotted Owl, a federally listed threatened species. This habitat is limited in size and therefore does not meet all the species' needs. The Collawash drainage, however, may provide some important dispersion habitat for the owl. The lower end of the corridor also provides some limited winter range for big game species. Based on the above factors, wildlife values were rated a "2" for the segment.

Ecological/Botanical: 3, Substantial

No known candidate or listed Threatened and Endangered plant species are known to be within the corridor. There is potential habitat for Corydalis aquaegelidae, a known sensitive plant that is a candidate species for federal listing as a Threatened plant. There is a good potential for location of Lycopodium and Botrychium in the headwaters; these are moisture dependent sensitive plants. The river corridor is also the northern most range of the sugar pine, Pinus lambertiana, which is found in isolated locations. Based on the above, the ecological/botanical values were rated a "3" for the segment.

Historical/Cultural: 2, Moderate

There is evidence of prehistoric use of the river by Native Americans; existing evidence of the use includes the presence of obsidian flakes and some peeled cedars in various locations throughout the corridor. There is a high potential for Native American camping sites, though none have been found at this time. There are also some cabin sites that have been found, but most of the structures have deteriorated. The above types of sites are not considered to be in good, interpretable condition, though they do have some local importance in interpreting the history of the area. Because of this, the historical/cultural values were rated a "2" for the segment.

Eligible: Yes

This determination is based on the outstandingly remarkable fishery values identified above. The substantial scenic, recreational, and ecological/ botanical values reinforce this determination.

Potential Classification: Scenic

The presence of roads into the corridor and some timber harvest units at each end of the corridor make the segment ineligible for a "Wild" classification. There are timber harvest units and roads present in the corridor but they generally are not visible from river itself except in the upper mile of the river, where units are more visible from the river. Since the major portion of the corridor maintains a largely primitive shoreline throughout most of its length, the segment qualifies for a "Scenic" classification.

Segment 2

From Buckeye Creek to Clackamas River

Mileage: 6.8 miles

Free flowing: Yes

Scenic: 3, Substantial

The river flows through a narrow, well dissected river canyon containing cliffs and talus slopes throughout the segment. There is also a large earth flow next to the river which is a point of interest. The river flows over and around many rocks, forming pools and cascades. The vegetative pattern is considered relatively common for the region. The presence of the road and associated cuts does reduce the visual quality somewhat. The river and related landform does provide some good photo opportunities, though they are not considered outstanding. Based on the above factors, scenic values were rated a "3" for the segment.

Recreational: 3, Substantial

The area along the river receives a variety of heavy recreational use. The road along the lower 1/2 of the segment is traveled by many people from around the state on their way to Bagby Hot Springs, a regional attraction. There is also a developed campground and a picnic area in the lower portion of the corridor. While the river is not considered a major rafting river, there are areas where recreationists use kayaks and small rubber rafts to play on the river. There is also some fishing and hiking that takes place along the river. Users are primarily from the local area, but with the travel route to Bagby Hot Springs going through the corridor, there is use by recreationists from around the region along the river. There is a potential interpretive opportunity sharing about the earth flows and other geologic features along the river. This opportunity is considered to be primarily of local importance with some users coming from around the region. Because of the level of use along the river as well as some regional use, recreational values were rated a "3" for the segment.

Geologic/Hydrologic: 4, Outstandingly Remarkable

There are a number of unstable earth flows along the river, some quite visible from the road. There is one area which could be considered a "textbook" example of a very active earth flow, and could be easily interpreted. Other hydrologic and geologic features found along the river might be considered relatively common in comparison to other rivers in the region. Because the "textbook" nature of the earth flow is considered to be outstandingly remarkable, a rating of "4" was given to the segment.

Fisheries: 4, Outstandingly Remarkable

Fish habitat quality is considered moderate for the segment. Anadromous fish using the river include spring chinook, winter and summer steelhead, and a late winter run of coho salmon. The coho are a rare native stock of salmon once found throughout the Columbia River basin but are now limited to the Clackamas river drainage. Because of the importance of this stock, fishery values were rated a "4" for the segment.

Wildlife: 2, Moderate

Habitat quality and quantity for big game is considered to be low for the corridor though there is limited important riparian habitat along the river itself. There is

limited habitat that would meet some of the needs of the Northern Spotted Owl, a federally listed threatened species. Based on the above, wildlife values were rated a "2" for the segment.

Ecological/Botanical: 2, Moderate

No known candidate or listed T & E plant species are know to be within the corridor. There is potential habitat for Corydalis aquae-gelidae, a known sensitive plant that is a candidate for listing as a threatened plant species. Other plant communities found within or adjacent to the river are relatively common for rivers throughout the region, though they may not be found along all rivers. Based on the above, these values were given a rating of "2" for the segment.

Historical/Cultural: 2, Moderate

There is evidence of prehistoric use of the river by Native Americans; existing evidence of the use includes the presence of obsidian flakes and some peeled cedars in various locations throughout the corridor. There is a high potential for Native American camping sites though none have been found at this time. These evidences do have local importance in interpreting the history of the area. Because of this, historical/cultural values were rated a "2" for the segment.

Eligible: Yes

This determination is based on the outstandingly remarkable geologic and fishery values as identified above.

Potential Classification: Recreational

The visible presence of the road from the river for almost all of the river segment, as well as the presence of some visible timber harvest units from the road and river make the segment ineligible for both the "Wild" and "Scenic" classifications. Because of this, the potential classification is "Recreational".

North Fork of North Fork Breitenbush River

The river section evaluated flows from Breitenbush Lake to the North Fork Breitenbush River.

Mileage: 4.1 miles

Free flowing: Yes

Scenic: 4, Outstandingly Remarkable

The river is located in the Olallie Scenic Area, an area of much visual diversity. Adjacent to the river, it is possible to see Mt. Jefferson, Ruddy Hill, Pyramid Butte, several meadows and lakes, sub-alpine forest stands, and the like. These provide excellent opportunities for scenic viewing and photography. The rough, unpaved, narrow road that provides access to the area blends in well and does not reduce overall visual quality. Because of the outstanding scenic qualities of the area, scenic values were rated a "4" for the river.

Recreational: 4, Outstandingly Remarkable

Recreational use in the area is dispersed in nature and includes activities like camping, hiking, mountain bike riding, and scenic driving. Due to distance and rugged road, use is low but the recreational experience is high for those seeking that type of experience. Dispersed roaded recreation opportunities of this quality are not found in very many other places throughout the region. Users do come from around the region. The river and adjacent area provide excellent opportunities for interpretation, especially for interpreting geologic and ecologic processes. Because of the outstanding recreational and interpretive opportunities, recreational values were rated a "4" for the segment.

Geologic/Hydrologic: 4, Outstandingly Remarkable

Several geologic/hydrologic processes are evident within the river corridor. There are some excellent examples of erosional down cutting by the river, volcanic buttes immediately adjacent to the corridor, and evidences of glacial activities. Because of the abundance and variety of these processes being present in one location, their ability to be seen and interpreted so easily, and the rarity of the combination being found regionally, a rating of a "4" was given for geologic/hydrologic values.

Fisheries: 2, Moderate

Wild resident brook and cutthroat trout occur in the river. Stream productivity is low to moderate due to short growing season for the fish, though habitat quality is moderate to high. Based on the combination of productivity and habitat quality, fishery values were rated a "2".

Wildlife: 3, Substantial

Area along the river does provide some habitat that could be used by the Northern Spotted Owl, a federally listed threatened species. The area around the river contains the largest concentration of pine martins on the Forest. While not a listed or candidate T & E species,

the pine martin is used as an indicator species for species needing old growth type habitats for their life requirements. The area provides good opportunities for viewing several different smaller wildlife species. The area along the river also provides good summer range for big game species. Based on these factors, wildlife values were rated a "3".

Ecological/Botanical: 4, Outstandingly Remarkable

The area around the river has a relatively young ecosystem due to past volcanic activity and glaciation and it provides excellent opportunities to observe early successional processes. There are many instances of early successional stages that are not found in a similar combination throughout the region. Because of this regionally unique combination of ecosystems, these values were rated a "4".

Historical/Cultural: 2, Moderate

The Breitenbush Guard Station is a structure that was built as a Civilian Conservation Corps project. This building is in interpretable condition and does have local importance for interpreting the history of the area. There are no known prehistoric sites within the area though there may have been some transitory use of the area by Native Americans. Based on the single type of site and it's local importance, historical/cultural values were rated a "2" for the river.

Eligible: Yes

This is based on the fact that scenic, recreational, geological/ hydrological, and ecological/botanical values were all found to be outstandingly remarkable along the river.

Potential Classification: Scenic

This classification is based on the fact that there is a road passing near and in two locations crossing over the river, thereby making it ineligible for a Wild classification. Overall, the shoreline and adjacent area do retain a largely undeveloped, primitive character. The adjacent road is only visible from the river in isolated locations. Based on these factors, the river qualifies for the Scenic classification.

Suitability Assessment - East Fork Hood River, Potential Wild and Scenic River July 12, 1990

State of Oregon, Mt. Hood National Forest, Hood River County

Summary

The East Fork Hood River (East Fork) was one of 12 rivers on the Mt. Hood National Forest identified by the public as a potential candidate for Wild and Scenic River designation in response to the *Draft Environmental Impact Statement* of the Forest Land and Resource Management Plan. In response to this, the Forest assessed the eligibility and potential classification of the 12 rivers, the results of which are in the preceding section of this appendix. In that assessment, segments 2 and 3 of the East Fork were found eligible for study as potential Wild and Scenic Rivers.

This suitability assessment is the next step in the river planning process for the East Fork. In this assessment, the Forest has evaluated alternative ways of managing the river and adjacent areas, both with and without Wild and Scenic River designation. In this evaluation, effects to a variety of concerns as well as protection of identified Outstandingly Remarkable values were considered. Based on the assessment, the preferred Forest Plan alternative is to not recommend the river to Congress for designation. Therefore, management of the river area will be based on the current direction in the Forest Plan for the land allocation along the river corridor.

Individuals and members of organizations that expressed an interest in the study were asked to provide their comments throughout the assessment process. These comments were considered in making the decision on the assessment.

Segments 1 and 2 of the river are within the Mt. Hood Meadows Ski area special use permit boundary. The ski area is in the process of completing an extensive master plan evaluating potential expansion of their facilities. The findings of this suitability assessment potentially affect the outcome of the Mt. Hood Meadows planning effort. Because of this, the suitability assessment for the East Fork was completed separately from the suitability assessments for the other eligible rivers on the Forest and the suitability decision on the East Fork is being made as part of the Forest Plan. The ski area master plan will be released concurrently or very soon after the Forest Plan and will incorporate the findings and decision of this assessment.

The remaining rivers on the Forest that were found eligible will be assessed for suitability at a later date. The free flowing nature, the values for which the river was found eligible, and the river's potential classification of Wild, Scenic, or Recreational will continue to be protected through the suitability studies for those additional rivers. For those rivers found suitable, the river values will be protected until acted upon by Congress.

The rational for the recommended alternative is contained in the Record of Decision for the Forest Land and Resource Management Plan.

Eligibility Findings and Potential Classification

A more detailed description of the eligibility evaluation process, evaluation criteria used, and eligibility findings can be found in the previous section of this appendix.

River Location, Eligibility Findings, and Highest Potential Classification

From the headwaters in the N.E. 1/4 of Section 4, T3S, R9E to the Forest Boundary on the North Section line of Section 32, T1S, R10E.

Segment 1

From the headwaters in the N.E. Section of Section 4, T3S, R9E to the top of Umbrella Falls (1.0 miles). This segment was not found eligible because it was not considered free flowing since the river has been channelized and flows through culverts for much of its length.

Segment 2

From the top of Umbrella Falls to the point that State Highway 35 crosses over the East Fork Hood River in the S.W. 1/4 of Section 11, T3S, R9E (1.5 miles). This segment was found eligible with a potential classification of Scenic.

Segment 3

From the point that State Highway 35 crosses over the East Fork Hood River in the S.W. 1/4 of Section 11, T3S, R9E to the Forest Boundary on the North Section line of Section 32, T1S, R10E (13.4 miles). This seg-

ment was found eligible with a potential classification of Recreational.

Potential for designation of the portion of river beyond the forest boundary was not studied and therefore not determined.

Summary of River Mileage

Study: 15.9 miles

Eligible: 14.9 miles

Outstandingly Remarkable Values by River Segment

The outstandingly remarkable values in Segment 2 are ecological/botanical. Within this segment, the river flows through a wet meadow complex that is unique for its size, type, and integrity in the central Cascades. The complex plays an important hydrologic role in providing high quality water to the river as well as providing important wildlife habitat for a large variety of wildlife species.

In Segment 3, no one value was considered to be outstandingly remarkable but a combination of substantial recreational, geological, wildlife, and ecological/botanical values were considered unique enough to be considered outstandingly remarkable in the region. These substantial values are summarized in the paragraphs below:

Recreational

The area receives heavy year round recreational use. Being close to the Portland metropolitan area as well as running adjacent to State Highway 35 for part of its length, the river is heavily used for fishing, day hiking, and camping during the summer. The river has anadromous fishing opportunities, primarily steelhead and coho, as well as resident trout. Use is high enough to require additional stocking of trout to meet the demand. In the winter, the area around the river also receives heavy use by cross country skiers, primarily in the upper portion of segment 3.

Geological

In a relatively short distance, the river flows through a variety of geologic formations and features. These include a glacial moraine with two water falls, across glacial outwash and flowing through a narrow canyon with alluvial and glacial deposits on one side of the river and steep canyon walls with numerous cliffs on the other side. This combination of features in a short distance and being so easily accessible for viewing and interpretation , while found in other locations in the Central Cascades, is still relatively unique.

Wildlife

The area within segment 2 and the upper portion of segment 3 provides very important habitat for big game in terms of critical elk rearing/deer fawning habitat as well as being part of an important migration route for those species.

Ecological/Botanical

This segment of river contains much diversity by having 3 of the 5 major forest types found on the Forest, as well as abundant and varied riparian plant communities, wetlands, and wet meadows. Additionally, a mudflow along the lower portion of the river provides opportunities to easily observe early successional stages of riparian habitat.

Table E-2 Existing Situation Along the River

Landownership	River Miles	Corridor Acres[1]
Segment 2[2] - Mt. Hood National Forest	1.5	528
Segment 3 - Mt. Hood National Forest	13.4	4,144
Total	14.9	4,668

[1] *Acres calculated using GIS.*

[2] *All of segment 2 is included within the Mt. Hood Meadows Ski area permit boundary*

Mineral and Energy Resource Activities

There are no oil and gas leases or mineral claims along the studied section of the river.

Potential is low for locatable minerals along the river based on present information. There is one quarry site for saleable materials such as road rock within segment 3 of the river.

There are 8 geothermal leases along the river, one with high potential for geothermal production. The other 7 leases have medium potential for geothermal production. Just above the headwaters in segment 1, there is a Known Geothermal Resource Area which is an area of high potential for the presence of geothermal resources.

Water Resource Developments

There are no existing or proposed water developments along the river other than a small diversion in segment 2 to supply water for laboratory analysis work at the Mt. Hood Meadows Sewage Treatment plant. The sewage treatment plant does not use water from the East Fork for treatment of the sewage but does release treated sewage effluent into the river. This plant is currently a secondary stage treatment plant and operates under an approved permit from the State of Oregon Department of Environmental Quality.

The Northwest Power Planning Council has amended the Columbia River Basin Fish and Wildlife Program and the Northwest Conservation and Electric Power Plan to incorporate "Protected Area" designations which recommend protection of critical fish and wildlife habitat areas from new hydroelectric development. A portion of segment 3 from Clark Creek downstream beyond the Forest Boundary is recommended for protection for anadromous fish only. The reaches of river from Clark Creek up to the headwaters are not recommended for a protected status at this time.

Transportation, Facilities, and Other Developments

The ineligible portion of the river in Segment 1 is heavily developed by the Mt. Hood Meadows Ski area with ski runs, culverts, a lodge, and parking areas.

Segment 2

In this segment, the access road from State Highway 35 to the ski area parking lot runs to the south of the river within the 1/4 mile corridor but is not visible from the river itself except in a few short sections. One road crosses the river providing access to the ski area sewage treatment plant. This plant is also adjacent to and partially visible from the river in this segment.

Umbrella Falls Trail #667, crosses the river just below Umbrella Falls. Sahalie Falls Trail parallels the river within and outside the corridor for the length of the segment.

Segment 3

State Highway 35 crosses the river just below Sahalie Falls at the upper end of segment 3. Both the highway and Forest road 3540 run along and cross the river within this segment, with Highway 35 being very visible from the river for most of the lower 1/2 of the segment. Road 3540 is used in the winter for cross country skiing with two ski trails coming off the road and crossing the river with rustic log bridges.

Two Forest Service developed campgrounds, Robinhood and Sherwood, are immediately adjacent to and visible from the river in Segment 3. East Fork Trail #650 parallels the west side of the river from Robinhood campground to Pollalie Creek. Portions of the Tamanawas Falls Trail #650A, Pollalie Trail #644, Zigzag Trail #678, and Gumjuwac Trail #480 are also in the river corridor.

There are no communities or other private developments along the river within the Forest boundary.

Recreation Activities

Segment 2 currently provides non-motorized recreation opportunities, primarily hiking with some hunting activity during hunting season. The stringer meadows area also provides opportunities for botanical study. The area within the segment is currently inventoried as Roaded Natural in the Forest Service Recreation Opportunity Spectrum (ROS) for the entire segment.

Segment 3 currently provides motorized and non-motorized opportunities including hiking, fishing, dispersed camping, Nordic skiing, camping opportunities at the 2 developed campgrounds along the highway, and some hunting during hunting season. Being part of the Mt. Hood Loop, the lower portion of this segment also receives heavy use by recreationists driving around Mt. Hood viewing scenery. The ROS classes in the corridor are currently inventoried as approximately 60% Roaded Natural and 40% Roaded Modified.

An estimate of recreation use in Segments 2 and 3 for 1987 and 2000 in Recreation Visitor Days (RVDs) is displayed in the following table:

Table E-3 Recreation Use in RVDs

Activity	1987 (RVDs)	2000 (RVDs)
Hiking	423	550
Fishing	850	1,210
Viewing Scenery	20,500	26,750
Camping: Developed	1,880	2,754
Camping: Dispersed	1,305	1,800
Picnicking	1,775	3,150
Hunting	100	130
Skiing: Nordic	600	1,160

In the study of Recreational Values on Oregon Rivers completed by Oregon State Parks, recreational values along segment 3 of the river were given an overall rating of "Outstanding" both for trout fishing and other recreational uses which would include hiking, cross country skiing, developed and dispersed camping. Salmon/Steelhead fishing was given a substantial rating in the study.

Wildlife and Fisheries

The area along segment 2 and the upper portion of segment 3 provides very important habitat for both big and small game wildlife species. The area provides critical elk rearing/deer fawning habitat as well as being a major migratory route for big game. The presence of timber harvest units adjacent to the river along the upper portion of segment 3 also provides high quality forage for big game species. The riparian area along the river provides important nesting and foraging areas for a wide variety of wildlife species. The lower portion of segment 3, with it's steep walled narrow canyon and the presence of State Highway 35, provides moderate to low quality habitat for most wildlife species.

There are no known threatened and endangered wildlife species residing within the corridor. There is some suitable habitat for the Northern Spotted Owl, a listed threatened species, along the river, but habitat quality has been lowered by fragmentation from past management activities such as timber harvest and road construction.

Segment 2 contains native trout but habitat quality is considered low due to a short growing season for the fish. Fishing use is estimated to be low in the segment.

Segment 3 contains both anadromous fish species as well as native rainbow and cutthroat trout. Sahalie Falls at the upper end of the segment blocks anadromous fish passage for spawning so they are found only in this segment. Steelhead are the primary anadromous species found in the river though there is also the presence of a remnant coho run. There is also suitable habitat for spring chinook salmon but their presence is unconfirmed. Habitat quality and productivity in the segment is considered moderate. Most of the anadromous fish are found in the lower 2/3 of the segment.

Because fishing pressure is high within the segment, Oregon Department of Fish and Wildlife stocks the river in several locations.

Ecological/Botanical

Segment 2

This segment flows through two distinct major vegetation types: forest/meadow mosaic, and closed subalpine forest.

The forest/meadow mosaic, known as stringer meadows, contains a complex arrangement of many plant communities and occurs just below Umbrella Falls. It was this meadow complex that was found to be the outstandingly remarkable value for the river segment. This complex is a large basin with numerous intermingled tree islands and diverse wetland areas which occur infrequently in Oregon. Most other subalpine meadows of the area are single large openings surrounded by large forested tracts or large basins with few scattered tree islands. This complex structure not only enhances scenic values, but also wildlife habitat. Stands of trees provide hiding cover next to many scattered open areas for foraging. Old growth forest along the lower riparian area also provides valuable wildlife habitat. The area provides critical ecological diversity at both the regional and local level and has many associated values. The vegetation in the meadows is in good to excellent condition and represents a relatively pristine, yet accessible subalpine site. The non-pristine conditions are adjacent to trails and where an access road cuts across one small wetland meadow. The stringer meadows area has high ecosystem integrity in that the hydrological patterns responsible for the complex pattern of plant communities appears to be stable and relatively unaltered by human impacts.

Both the resistance to impacts and recovery potential (resilience) of the wetland vegetation are low. The plant cover is easily damaged by light impacts (low resistance) and once altered, the harsh climate makes plant re-establishment extremely difficult and slow (low resilience).

This river segment environment is alpine and sub-alpine. There is a very short growing season which is dominated by occasional low temperatures, high daily temperature fluctuations, late summer drought, and extreme wind conditions.

The segment is considered potential habitat for 19 threatened, endangered or sensitive (T & E) plant species. An Oregon Natural Heritage Database extract for this area indicates that one T & E species, Calamagrostis breweri was sighted in the segment in 1924. A T & E survey has been conducted as part of the Mount Hood Meadows Master Development Plan Environmental Impact Study in 1988 and 1989 for parts of the segment. Of the area surveyed, no threatened, endangered or sensitive plant species have been reported.

Ecological investigation of wetlands throughout the Mt. Hood and Gifford Pinchot National Forests in 1988-89 and alpine areas around Mt. Hood in 1989 has revealed that the stringer meadows complex is indeed outstanding and unique for the Cascades of Oregon and Washington.

Segment 3

This segment includes three of the five major forest zones present on the Mt. Hood National Forest as well as varied riparian plant communities and several wetlands and wet meadows. The upper elevation reaches include mountain hemlock zone plant communities on upland soils. Most of the upland area in this segment is in the Pacific Silver fir zone and is typical of that found on much of the Mt. Hood National Forest. The lowest elevations, primarily the west aspects downstream from Sherwood Campground, are within the Grand fir zone. An unusual additional ecosystem component is the abundance of recent complex mudflow and glacial outwash soil areas which support sparse, stressed vegetation quite unlike that found on the surrounding soils. The presence of this mudflow and associated vegetation in early successional stages were part of the substantial values contributing to outstandingly remarkable value for the segment.

Numerous wetlands in the segment and the many miles of riverside and streamside riparian plant communities offer a diverse and productive assemblage of ecosystems which have great local significance to many species of wildlife. These areas have received various levels of impact both from the proximity to State Highway 35 and extensive, high-impact timber harvest which has occurred in some portions of this segment.

There is a potential for threatened and endangered species in the segment because of the extensive riparian area, wide elevation range and broad range of forest zones. Few surveys have been conducted in the segment and no species have been found at this time.

Streamflow

There are no major structures within either segment that affects streamflow. The river has been channelized slightly in the lower portion of segment 3 by some fill material for State Highway 35.

Flows were measured on the East Fork at the upper end of segment 2 in a water quality study conducted as part of the Mt. Hood Meadows ski area expansion effort. In this study, average flows ranged from a maximum of 13 cfs in August, 1989 to a minimum of 3.5 cfs in January, 1990.

Geology

The river starts in an area of glaciated pyroclastic debris, flowing through a glacial moraine from the Frasier glaciation period. This moraine contains and is responsible for the formation of Umbrella and Sahalie Falls, the two notable waterfalls found on the river. The river then flows adjacent to and over glacial outwash material and through a narrow canyon with walls consisting of alluvial and glacial deposits on the west side of the river and primarily andesite on the east side of the river. The canyon floor consists of clastic debris and alluvium. There is a recent debris torrent entering the river at Pollalie Creek extending off the Forest for a distance of about 12 miles. This debris torrent and associated ecological values contributed to the finding of outstandingly remarkable for segment 3 of the river.

Cultural Resources and Native American Uses

There is one historic horse corral in poor condition in segment 3 which is the only inventoried site of significance in the corridor. Cultural resource inventory work in the past has been only for specific projects. There are potential prehistoric hunting camps along the river.

Under the Tribes of Middle Oregon Treaty of 1855, the Forest Service is responsible to honor specific treaty rights within lands ceded to the U.S. Government. These rights include the taking of fish, wildlife, and plants for personal and religious purposes. On the Mt. Hood National Forest, those lands fall east of the Cascade summit and include the East Fork. The Confederated Tribes of the Warm Spring Reservation have expressed that the area along the river, especially the stringer meadows area, is important to the tribe for his-

torical and traditional uses and for providing those commodities protected in the treaty rights.

Timber

Segment 2 is within the Mt. Hood Meadows Ski area permit boundary and is not suitable for regulated timber harvest. Of the 4,144 acres within the corridor in segment 3, approximately 79 percent is suitable for timber harvesting.

The table below displays timber volume and yield information for segment 3.

Table E-4 Volume and Annual Sale Quantity (ASQ)

	ASQ		
Total Timber Volume	Potential Harvest with Legal Requirements	Forest Plan Preferred Alternative	Designated as Wild and Scenic River as Classified
121.0 MMBF	2.0 MMBF	1.4 MMBF	1.4 MMBF

Livestock Grazing

There are no grazing allotments along the river and no grazing activities at this time.

Socio-economic

Recreation activities such as fishing, hunting, hiking and Nordic skiing have been a major attraction along the river and this use is increasing. The alpine skiing industry is also experiencing growth in numbers of skiers. Because of this growth, Mt. Hood Meadows ski area is considering expansion into the river corridor in segment 2. The growth of the recreational activities along the river has importance economically to Government Camp, the communities of Hood River valley, and to some extent, the communities of the greater Portland metropolitan area.

Timber harvest has taken place within the corridor in the past and plays an important role in the economic well being of local timber mills, such as those in the Hood River valley.

Current Administration

The entire length of the river studied is within the jurisdiction of the Mt. Hood National Forest and is to be managed under the direction of this Forest and Land Resource Management Plan.

Alternatives Considered

This section summarizes the alternatives that were evaluated in detail for the river suitability assessment. Four alternatives were evaluated for each eligible segment in order to consider a full range of alternatives. Alternatives were developed to allow different levels of protection for identified "outstandingly remarkable" values, alternative methods of protecting those values, and alternative management allocations along the river segment consistent with the Forest Land and Resource Management Plan. They were also designed to address specific concerns identified by key public individuals and groups. All alternatives meet current applicable laws, regulations, and Forest Plan direction. The alternatives by segment are:

Segment 2

The outstandingly remarkable value for this segment was the stringer meadows wetland complex and its uniqueness in the Central Cascades for a wet meadow complex based on size, type, and integrity. The meadow complex provides very important ecological diversity for a large number of plant and animal species in a relatively small area.

This segment was found eligible with a potential classification of "Scenic".

The area adjacent to the river corridor in this segment is within the Mt. Hood Meadows Ski Area Special Use Permit. Mt. Hood Meadows is currently in the process of developing a new ski area master plan that is looking at alternatives for expansion. Some of those alternatives studied in the ski area planning effort have the potential to adversely impact the wet meadow complex that was determined to be the outstandingly remarkable value for the river. Final decisions on ski area expansion are dependent upon the final decisions for this suitability analysis. The ski area master plan will incorporate the

final suitability decision into the selected alternative for that plan.

For all alternatives within this segment, the following Forest Plan direction would apply:

"No regulated timber harvest would take place within the river corridor. Harvest for salvage and ski area development and operations would be allowed consistent with land allocation."

Existing monitoring, survey, and protection of cultural resources and known threatened, endangered, and sensitive species would continue in conformance with current laws and regulations.

Segment 2, Alternative 1 (Forest Plan Alternatives A, C, E, and NC)

This alternative is designed to allow maximum flexibility for development of ski area facilities along the river, including the potential for development within the wet meadow complex for ski area expansion. Actual impacts to designated wetlands is protected by E.O. 11990 which requires mitigation measures be taken if there are adverse effects from development. This mitigation can include development of alternative wetland areas in other locations. The river segment is not recommended for designation as a National Wild and Scenic River.

Emphasis is on managing the area in the allocation for developed winter sports recreation. Overnight housing, ski lodges, and associated facilities such as parking, trails, etc. may be developed along the river if the selected alternative in the ski area master plan allows it. Development within the river corridor would be required to mitigate specific resource concerns identified in the ski area master plan. If overnight housing is approved in the master plan, year round use would be allowed and the ski area would be required to develop a summer use management plan to manage that use and protect resources along the river and around the ski area.

The Visual Quality Objective (VQO) for this allocation is partial retention as viewed from major travel routes and view points outside the ski area. The VQO for the portion of Umbrella Falls Trail #667 that is adjacent to the river in the segment is partial retention in the near foreground and modification in the far foreground as viewed from the trail. There is no VQO objective as viewed from the river. (Near foreground is that area within 1/8 mile each side of the trail. Far foreground is that area which is between 1/8 and 1/4 mile each side of the trail.)

Fish and wildlife enhancement projects may take place if not in conflict with management of the area for ski area management.

State agencies and the Forest Service would continue to monitor water quality. The ski area sewage treatment plant would not be allowed to increase discharges of pollutants into the river without a revised permit from Oregon Department of Environmental Quality.

Segment 2, Alternative 2 (Forest Plan Alternatives H and Q (Preferred))

Same as alternative 1 except would have an A-4, Special Interest Area (SIA), allocation around the stringer meadows area. This SIA would be approximately 110 acres in size and would provide an undeveloped area around the actual wet meadows to protect the values of the meadow. The purpose of the SIA will be to protect and interpret the associated values of the meadow complex.

Emphasis is on managing the area for developed winter sports recreation in all areas of the A-11 allocation. Emphasis in the SIA is to protect the integrity and value of wet meadow complex while also providing limited development of hiking trails and similar facilities to accommodate visitor use and provide for interpretation. These facilities would be designed to direct use in the SIA and minimize impacts to SIA values. Other facilities such as new ski runs, ski lifts, and new roads would not be allowed in the SIA. Motorized vehicle use will be prohibited within the SIA. There will be a designated route for over-snow machine use to be used only by the ski area to the north side of the SIA. No road building will be associated with this designated route and use will be limited to periods where there is adequate snow cover on the route to protect the surface vegetation.

Overnight housing and associated facilities may be developed in the A-11 allocation dependent upon selected alternative in the ski area master plan. If overnight housing is approved in the master plan, year round use would be allowed and the ski area would be required to develop a summer use management plan to manage that use and protect resources along the river and around the ski area.

VQO is partial retention for the A-11 land allocation and retention for SIA as viewed from major travel routes and viewpoints outside the ski area boundary. The VQO standard for the portion of Umbrella Falls Trail #667 that is adjacent to the river in the segment is partial retention in the near foreground and modification in the far foreground as viewed from the trail. There

are no specific objective for VQO's as viewed from the river.

Fish and wildlife enhancement projects may take place if not in conflict with management of the area for ski area management in A-11 allocation or the purpose of the SIA.

State agencies and the Forest Service would continue to monitor water quality. The ski area sewage treatment plant would not be allowed to increase discharges of pollutants into river without a revised permit from Oregon Department of Environmental Quality.

Segment 2, Alternative 3 (Forest Plan Alternative F)

This alternative would recommend the river segment be designated a National Wild and Scenic River (B-1 allocation) with a classification of "Recreational". Interim corridor width would be 1/4 mile each side of river and wider if necessary to include the wet meadow complex. Land adjacent to the river corridor would be allocated A-11 and managed for developed ski area operations.

If the river is designated, a river management plan would be developed that would set forth management direction for the river and determine the final river corridor boundary.

Emphasis would be on managing the area for protection and enhancement of river related values as well as providing recreational opportunities to visitors to the extent that river values are protected and/or enhanced. All facilities developed within or outside river corridor must protect the wet meadow complex and existing water quality. Overnight housing, ski lodges and other associated facilities may be developed outside the river corridor if river values are protected. Some facilities may be constructed inside the corridor provided they meet VQO of partial retention as viewed from the river or trails along the river. No ski area facilities other than trails designed to protect the meadow would be allowed in the wet meadow complex.

Actual facilities to be developed within and adjacent to the river corridor would be dependent upon the selected alternative of the ski area master plan and direction developed for the river corridor in the river management plan. If overnight housing is approved in the master plan, year round use would be allowed and the ski area would be required to develop a summer use management plan to manage that use and protect resources along the river and around the ski area.

Construction of facilities both inside and outside the river corridor that have the potential to impact water quality either through use or design need to be designed, constructed, and managed protect the water quality of the river in conformance with the non-degradation requirement of the Wild and Scenic Rivers Act.

The VQO as viewed from the river and trails along the river would be partial retention in the foreground. VQO for lands adjacent to river corridor would be partial retention as viewed from major travel routes and viewpoints outside the ski area boundary.

Fish and wildlife enhancement projects would be allowed in the river corridor to the extent that they protect and/or enhance river related values.

State agencies and the Forest Service would continue to monitor water quality. The ski area sewage treatment plan would not be allowed to increase discharges of pollutants into the river in conformance with the non-degradation requirement of W&SR act. Efforts would be made to reduce level of pollutants allowed to enter river from sewer plant. Other ski area expansion activities and facilities would need to be designed to protect the water quality of river.

Segment 2, Alternative 4 (Forest Plan Alternative I)

This alternative, like Alternative 3, would also recommend the river segment be designated a Wild and Scenic River, but with a classification of "Scenic" instead of "Recreational". The interim corridor width would be 1/4 mile each side of the river and wider if necessary to include the wet meadow complex. Land adjacent to the river corridor would continue to be allocated A-11 and managed for developed ski area operations.

All other aspects of this alternative would remain the same as Alternative 3 except the VQO would be retention as viewed from the river and trails along the river. Few, if any, ski area facilities would be able to be constructed in the corridor since it would be difficult to meet VQO standards.

Segment 3

The Outstandingly Remarkable value in this segment was not one specific value but it was felt that the combination of substantial Recreation, Geologic, Wildlife, and Ecological/Botanical values was unique enough to be considered "Outstandingly Remarkable" in the Central Cascades.

Recreation values include an important native and anadromous fishing opportunity, as well as other dispersed and developed recreation opportunities including hiking, cross country skiing, mountain biking,and camping in both developed campgrounds and dispersed campsites adjacent to the river. Geologic values include a variety of easily seen features associated with glaciation, volcanism, and the effects of how the river shaped the surrounding landscape. Wildlife values included the presence of critical elk rearing/deer fawning areas as well as being a part of a major big game wildlife migratory route. Ecological/botanical values include vegetative diversity, the presence of important riparian habitat in the upper corridor and a recent debris flow in the lower corridor that provides an opportunity to easily observe early plant community successional stages.

This segment was found eligible with a classification of "Recreational".

For all alternatives within this segment, Forest Plan direction would require monitoring, survey, and protection of cultural resources and known threatened, endangered, and sensitive species be continued in conformance with current laws and regulations.

Segment 3, Alternative 1 (Forest Plan Alternative C)

In this alternative, the river segment is not recommended for designation as a National Wild and Scenic River. Area within and adjacent to the segment would be allocated C-1, Timber Emphasis.

Full regulated timber harvest would take place within the river segment. Emphasis would be on intensive timber management designed to maximize timber outputs from the land while meeting minimum management requirements specified in the Forest Plan Standards and Guides.

Dispersed recreation activities that are not in conflict with timber management activities may be provided. Existing dispersed recreation facilities such as trails, trailheads, bridges, and sites would be protected. Existing developed recreation sites would be maintained but no new sites would be developed. Some new dispersed winter trails may be developed. Off-highway vehicle use would be allowed consistent with resource protection needs.

The VQO for the river and adjoining area as viewed from major travel routes would be modification for the foreground and middleground and maximum modification for the background. VQO standards for the East Fork Trail #650 would be partial retention in the near foreground and modification in the far foreground as viewed from the trail for the segment of trail between Sherwood and Robinhood campgrounds. Between Sherwood campground and the Pollalie Trailhead, the VQO standard for the trail would be is retention in the near foreground and partial retention in the far foreground.

Fish and wildlife enhancement projects could take place to the extent that they do not conflict with timber management activities.

State agencies and the Forest Service would continue to monitor water quality. Forest Service would continue to assess resource activities that may affect water quality.

Segment 3, Alternative 2 (Forest Plan Alternatives A, E, NC, and Q [Preferred])

The river segment is not recommended for designation as a National Wild and Scenic River. The area within and adjacent to the segment would be allocated to a "B" allocation such as B-2, Scenic Viewshed; and/or B-9, Wildlife-Visual

Regulated timber harvest could take place within the corridor but would be done at a reduced harvest level to protect and/or enhance visual resources and wildlife management objectives. Overall intent is to leave the forest in a natural appearing condition.

Recreational emphasis in the B-2 allocation is to provide a variety of year round dispersed recreation opportunities along and adjacent to the river area including hiking, Nordic skiing, mountain biking, fishing and camping. New dispersed opportunities would be provided based on demand consistent with allocation standards and guidelines. Existing and new developed recreation opportunities such as camp and picnic grounds would also be provided as needed consistent with meeting other standards and guidelines for the allocations. Limited off-highway vehicle use would be allowed consistent with resource protection needs.

Recreational emphasis in the B-9 area would be to provide non-motorized, dispersed recreation opportunities. No new camping or picnic areas would be developed in this allocation. No off-highway vehicle use would be allowed and there would be significant use restrictions on roads other than State Highway 35 through seasonal or permanent closure to minimize the disturbance to wildlife species.

The VQO along the river and adjoining area would be retention in the foreground and partial retention in the middle ground and background when viewed from major travel routes and high recreation use areas. VQO standards for the East Fork Trail #650 are partial retention near foreground and modification far foreground as

viewed from the trail for the segment of trail between Sherwood and Robinhood campgrounds. Between Sherwood campground and the Pollalie Trailhead, the VQO standard for the trail would be retention in the near foreground and partial retention in the far foreground. In places with differences in VQO standards, the most restrictive would apply.

In the B-2 and B-9 allocations, wildlife and fishery habitat improvement projects are allowed consistent with meeting the VQO requirements above.

In the B-9 allocation, emphasis is to provide and enhance quality habitat for wildlife species, especially big game. Small openings to provide additional forage for wildlife species would be provided, especially in the migration areas. Additionally, areas of high quality hiding and thermal cover as well as important riparian areas would be provided and protected to meet wildlife species needs. These areas would be provided consistent with meeting VQO requirements for the allocation.

State agencies and the Forest Service would continue to monitor water quality. Forest Service would continue to assess resource activities that may affect water quality.

Segment 3, Alternative 3 (Forest Plan Alternative H)

The river segment is not recommended for designation as a National Wild and Scenic River. Area within and adjacent to the segment would be allocated to A-7, Special Old Growth throughout the segment.

No regulated timber harvest would be allowed along the length of the segment. Salvage timber harvest may take place if it meets the objectives of the allocation. Overall objective in the allocation is to maintain old-growth plant communities with their important wildlife and plant habitat, ecosystem diversity, and aesthetic qualities, while providing a high degree of interaction between people and the old-growth communities.

Emphasis is to provide the many significant values related to old-growth forests. Because of this, recreation development would be limited to dispersed type opportunities such as interpretive, hiking, mountain biking, and Nordic ski trails. No motorized use off developed forest system roads would be allowed. New recreation sites would not be developed.

The VQO for foreground, middleground and background would be preservation throughout the segment.

Fish and Wildlife habitat improvement projects may take place provided they are consistent with protection and/or enhancement of the old-growth values of the area and meet the VQO above.

State agencies and the Forest Service would continue to monitor water quality. Forest Service would continue to assess resource activities that may affect water quality.

Segment 3, Alternative 4 (Forest Plan Alternatives F and I)

This alternative would recommend the river segment be designated a Wild and Scenic River (B-1 allocation) with a classification of "Recreational". The corridor width would be 1/4 mile each side of the river.

Regulated timber harvest would take place within the river corridor but would be done at a reduced harvest level to protect and enhance river values. Overall intent would be to leave the forest in a natural appearing condition.

Recreational emphasis is on managing the area for protection and enhancement of river related values as well as providing a variety of dispersed and developed opportunities. Off-highway vehicle use may be allowed only on designated trails within the river corridor. Additional summer and winter trails and trailheads would be developed along the river area to meet visitor demand and would be designed to protect river values.

Existing facilities along the river would remain and be improved for visitor convenience and resource protection purposes as identified to the extent that they meet VQO standards and do not adversely impact river values and water quality. New facilities such as camp and picnic grounds, and summer and winter use trails and trailheads may be constructed to meet visitor needs with same restrictions as above. Facilities would not be built in important riparian areas unless the values of those riparian areas can be protected. Construction of facilities outside of river corridor that have the potential to impact water quality would need to be designed and constructed to protect water quality of river in conformance with the non-degradation requirement of the Wild and Scenic Rivers Act.

The VQO as viewed from the river, as well as trails and State Highway 35 where they are in the corridor, would be partial retention foreground and middleground. VQO standards for the East Fork Trail #650 would be partial retention near foreground and modification far foreground as viewed from the trail for the segment of trail between Sherwood and Robinhood campgrounds. Between Sherwood campground and the Pollalie Trailhead, the VQO standard for the trail would be retention near foreground and partial retention far foreground. In places with differences in VQO standards, the most restrictive standard would apply.

Fish and wildlife enhancement projects would be allowed in the river corridor to the extent that they protect and/or enhance river related values.

State agencies and the Forest Service would continue to monitor water quality. Management activities within and adjacent to the river corridor would be evaluated to insure protection of water quality in conformance with the non-degradation requirement of the W&SR act.

Summary of Suitability Alternatives in Relation to Forest Plan Alternatives

In the final EIS for the Forest Plan, the preferred Alternative Q does not recommend Wild and Scenic River designation for the river. In this alternative, the stringer meadows area would be designated a Special Interest Area within Mt. Hood Meadows Ski Area boundary. The remainder of the area along the river within the ski area will be managed for Winter Recreation. The river below the ski area will be managed for protection of wildlife habitat and visual quality.

In all alternatives, segment 1 of the river is not recommended for Wild and Scenic River designation since it was not found eligible and will be managed under an A-11, Winter Recreation allocation.

Other Forest Plan Alternatives and their relation to the Suitability alternatives are:

Alternatives A, E, and NC

Not recommended for designation. The river area will be managed for winter recreation within the ski area boundary and protection of wildlife habitat and visual quality outside the ski area boundary.

Alternative C

Not recommended for designation. The river area will be managed for winter recreation within the ski area boundary and intensive timber harvest outside the ski area boundary.

Alternative F

Segments 2 and 3 are recommended for designation with a Recreational classification.

Alternative H

Not recommended for designation. There will be a Special Interest Area around stringer meadows with remainder of area in ski area boundary managed for winter recreation. Area outside ski area managed for special old-growth protection.

Alternative I

Segment 2 is recommended for designation with a Scenic classification and segment 3 is recommended with a Recreational classification.

Environmental Consequences

This section summarizes the environmental consequences that would result from implementation of each of the alternatives. From this, comparisons can be made between alternatives for analysis purposes.

The specific resources/values evaluated are related to public and management concerns that were raised during the analysis process by members of the public, organizations interested in the study, other agencies, and Forest Service personnel. Evaluations are listed by concern area with consequences summarized by alternative. The effects to physical and biological resources/values such as ecological/botanical, wildlife, fisheries, and geology are the first evaluated. Following that section, consequences to social resources/values are evaluated. These include recreation, visual resources, Mt. Hood Meadows Ski area, timber harvest, cultural resources, and water rights.

Effects to Biological and Physical Resources/Values

Ecological and Botanical Values

Segment 2

The ecological and botanical values of the stringer meadow wet meadow complex were the outstandingly remarkable features identified in the Wild and Scenic River eligibility study for this river. Proposed ski area developments have the potential to adversely impact the hydrology and soils of this unique meadow complex thereby degrading their important ecological and botanical values. Human use also directly degrades the unique plant life by direct removal of plants, trampling, etc.

The wetland vegetation is extremely sensitive to trampling and equipment impacts. The surface soil and vegetation stays moist most of the time that the snow cover is lacking. Even a small amount of foot traffic can cause direct vegetation and soil damage which could ultimately lead to reducing the vegetative diversity of the area. Increased use within and immediately adjacent to the meadows is likely to cause permanent damage to the ecological and botanical features which are so remarkable.

Alternative 1

This alternative would allow current management activities to occur and development of major ski area facilities within the meadow complex, if approved . These facilities would require approval from the U.S. Army Corps of Engineers under the Clean Water Act if they were to be developed in the wet meadows themselves. Executive Order 11990 does allow for development in wetlands if adverse impacts can be mitigated. This mitigation can be enhancement of wetland values in alternate locations. Other than the above, this alternative provides no additional protection for outstandingly remarkable values beyond those contained in normal best-practice National Forest management.

If development is approved in or immediately adjacent to the meadow complex, there would be substantial direct, negative, irreversible impacts to plant and animal life as well as the soils of the stringer meadow complex. These impacts would be caused by heavy equipment intrusion in the stringer meadows complex and by the greatly increased year-round human use of this area. Facility development in areas having a high water table may interrupt subsurface flow of water resulting in dewatering or flooding of adjacent areas. Changes in water table level is very likely to reduce the diversity of vegetation in the meadows. Increased runoff would likely result in erosion and stream sedimentation due to little or no buffer. Ecological values of the interspersed meadow and forest will also be degraded as vegetation structure and composition are altered by human and equipment impacts. Change of the flora within a couple of decades could be substantial. There will likely be permanent loss of much of the extremely diverse and showy species with replacement by more common species resistant to human activities, including noxious and non-native species.

The preliminary preferred alternative for the ski area development plan would not construct facilities other than hiking trails or similar low impact facilities in the wet meadow complex. If this ski area alternative is selected, effects to the complex would be similar to those listed in alternative 2 below.

Alternative 2

This alternative would allow only low development level facilities such as hiking trails to be developed within the wet meadow complex. The trails would be designed to protect and interpret the values of the wet meadow. Year round use could still be allowed in the ski area and overnight housing could be developed outside the Special Interest Area. The design of the special interest area is intended to provide a buffer of forested land around the meadows complex to provide additional protection of the meadow values. If overnight housing is approved, use will increase during the summer months when the meadow complex will not have a protective layer of snow over the meadow vegetation.

While trails will be designed to protect the wetland values and to direct use within the wetland complex, it is likely that there will be some intrusive use of the wetlands by recreationists if recreational use increases in the area. In locations where these intrusions take place, vegetation will be negatively impacted in a way similar to what is described in alternative 1 above, though to a much lesser extent and only in very localized areas where that use is taking place. Impacts can be expected closer to areas where use is taking place outside the meadow complex. Discouraging use in and around the more fragile wetlands will reduce long term vegetative degradation.

Careful management of human entry and exclusion of equipment intrusions should allow persistence of ecological and botanical values. Unless access is

limited in more sensitive areas, long-term damage to the fragile plant resource is likely. Some increased runoff, erosion, and stream sedimentation into the river itself may be difficult to avoid, dependent upon the level and proximity of ski area development allowed outside the SIA.

Alternative 3

This alternative provides substantial protection of the outstandingly remarkable features of this river segment. Congressional protection for this area assures a high level of protection. Facilities that would adversely impact wetland values would not be allowed in or near sensitive wetlands under this alternative.

Establishing a wide corridor width around the stringer meadows complex area will dictate that facilities of the ski area resort, if approved, will be sufficiently far away from sensitive wetlands as to reduce the amount and extent of human use. Discouragement of foot travel and strict prohibition of any and all heavy equipment use would maintain outstandingly remarkable values of this segment.

Some facilities could be built within the river corridor, but they could not be placed to damage the sensitive stringer meadow complex. Such facilities could attract substantial numbers of people to the meadow complex unless facility placement and design are carefully coordinated with the outstandingly remarkable values in mind.

Alternative 4

This alternative is very similar to alternative 3 but more restrictive in the level of development that could be allowed in the river corridor, therefore providing an additional level of protection from adverse effects from development.

Segment 3

The river and adjacent riparian and wetland areas within this segment provide some outstanding habitat for a great variety of plant species and communities. The corridor also includes unusual plant communities which have formed on relatively recent volcanic and glacial-related mudflows off of Mt. Hood. These communities and the successional processes they show have high scientific, educational and natural values.

Some of the river corridor includes old-growth forests of fairly unusual composition. In this area, 3 of the 5 major forest zones of the Forest come together. Hence, there is a flora representing a combination of western Cascade communities (i.e., western hemlock and silver fir zones) and eastern Cascade plant communities (including grand fir and ponderosa pine). The river corridor also provides a potential linkage for migration of animals and plants from the Mt. Hood area and western Cascade areas to the Surveyor's Ridge and eastern Cascade areas of the Barlow Ranger District.

There are no known threatened, endangered, or sensitive plant species associated with this area although there is habitat where such species may occur. Project specific detailed surveys would be conducted under each alternative.

Alternative 1

Riparian management standards would provide substantial protection for riparian and wetland values, but some localized degradation of some wetland and riparian areas would occur from timber harvest activities. The wildlife habitat value of conifer forests near these wetlands and riparian areas would be substantially reduced. Some old-growth stands, including the unusual combination of forest zones, would be eliminated. Some of the unusual mudflow plant communities would also be eliminated or degraded. In areas of intensive harvest, soil damage such as compaction, rutting, and subsequent erosion will take place, especially along skid trails and other areas where heavy equipment is used. This will likely cause increased sedimentation in streams. The linkage for animal and plant migration that this area provides between east and west Cascade areas would also have reduced effectiveness.

Because of a higher level of land disturbing activities, there is a higher potential for disturbance of threatened, endangered, or sensitive plant species, though the presence of these species, if they exist in the area, should be identified in project specific surveys and should receive protection at that time.

Alternative 2

Ecological and botanical values would receive much greater protection than alternative 1, but could still receive some adverse impacts in locations where timber harvest and other intensive management would be allowed. Managers should be able to inventory and assess most riparian and wetland sites and these features should be protected. Some of the smaller wetlands and some of the forested wetlands may be missed during project planning and could suffer adverse impacts from heavy equipment because the soils and understory vegetation are extremely sensitive to these impacts. The habitat value of the area, especially the upper portion of the corridor should meet most of the needs of wildlife species in the area. The unusual mudflow plant com-

munities could be identified and protected. There may be some adverse impacts to soils similar to what was described in alternative 1 but would occur to much lesser extent due to reduced harvest levels throughout the river corridor. The corridor may have some reduced overall habitat value for plant and animal migration from east to west Cascade areas resulting from additional harvest in along the river.

Alternative 3

This alternative provides the greatest protection of fragile wetland and riparian communities as well as the scientifically interesting and unusual mudflow plant communities. Overall habitat value for plant and animal species would remain fairly high. Adverse impacts to soils will be minimal. The area will continue to serve as an important linkage between eastern and western Cascade areas for animal and plant migration.

Alternative 4

This alternative provides substantial protection to major ecological and botanical values in the corridor. Timber harvest, if conducted, would be subject to careful review for its impacts on the outstandingly remarkable combination of features of this segment. Hence, the wetland, riparian and unusual mudflow plant communities would have a high level of management protection from adverse effects resulting from timber harvest or facility development. Impacts to soils would be the same as alternative 2. The increased National level of protection and identity could lead to greater funding for resource protection. Yet, this greater notoriety could lead to increased recreational use of fragile wetlands and riparian corridors which could adversely impact fragile soils, plants, and wildlife habitat.

Wildlife Values

The area along the river provides important wildlife habitat for a number of wildlife species. The meadow complex and its diversity provide both forage and hiding cover for wildlife. The area around the river below the meadow complex in segment 2 and into the upper portion of segment 3 contains critical elk rearing/deer fawning habitat as well as being a part of a major migratory route for big game species. Wildlife values along the river in Segment 3 were one of the substantial resource values contributing to the outstandingly remarkable finding in the eligibility study for the river.

Segment 2

Alternative 1

Winter use by skiers has little impact to wildlife due to the protective layer of snow and seasonal absence of many wildlife species. The area currently receives low intensity visitor use during the summer months. If the Mt. Hood Meadows Ski Area expands to full season use, summer visitor use is expected to increase accordingly. Increased summer use could increase physical impacts to wildlife habitat, direct disturbance to wildlife, and cause displacement of certain species. These effects would result in decreased species diversity within and adjacent to the meadow complex, with a corresponding increase in opportunistic species (species that prefer disturbed habitats). Increased predation on existing species by opportunistic species may occur.

If the preliminary preferred alternative for the ski area development master plan is implemented, only facilities such as hiking trails which will direct use will be allowed in the wet meadow complex with limited development below the meadows along the river. This will reduce the impacts listed above but there will still be some displacement of wildlife species from increased number of visitors as well as habitat damage in those places where visitors leave designated trails. The amount of trails and visitor use on the edges and within the meadows may be directly correlated to the amount of impacts to the habitat, disturbance, and species diversity.

Alternative 2

Impacts will be very similar to Alternative 1 if the preliminary preferred alternative for the ski area development plan is implemented.

Alternative 3

Same as Alternative 2 but providing additional protection to the area below the meadow complex by limiting types of development, thereby reducing impacts to ecologically sensitive areas.

Alternative 4

Same as Alternative 3.

Segment 3

Alternative 1

A narrow buffer will protect most of the riparian areas and areas classified as unsuitable. However, buffers will be susceptible to blowdown, which is common in the area. Emphasis on timber harvest will reduce the

diversity of habitat within the corridor. Riparian buffers may become ineffective and use within the buffers reduced, due to lack of access and loss of habitat caused by blowdown. If riparian areas and adjacent areas are harvested or subject to blowdown, displacement may occur for both game and non-game species. Duration of displacement may be long as well as short term. Riparian and adjacent habitat are used as key reproductive sites for many avian, herptile and mammalian species.

Alternative 2

Wildlife habitat will have very little if any disturbance through management activities and may be enhanced by prescribing some harvest to meet wildlife objectives. Adequate buffers will be maintained and loss to blowdown minimal. No displacement of game or non-game species should occur. With regulated timber harvest, critical habitat will be maintained.

Alternative 3

Wildlife habitat will be undisturbed by management activities and will better meet the needs of species requiring older-aged climax ecosystems No harvest will be done to meet the needs of wildlife species and less forage may be available for some big game species. Loss to blowdown will be minimal and no dispacement of game or non-game species should occur.

Alternative 4

Same as Alternative 2.

Fisheries/Water Quality

The lower 2/3 of segment 3 is important for both anadromous and native species. The river currently receives very heavy fishing pressure and there is a need to protect the fish habitat and river water quality. The different management strategies in the various alternatives have the potential to impact fish habitat and water quality by affecting bank stability, stream hydrology, amount of hiding cover, availability of biological structures in the river, potential gravel supplies, amount of siltation, changes in temperature, non-point source pollution from parking lots and road sanding operations, and discharges from the Mt. Hood Meadows ski area sewer plant.

Segment 2

Alternative 1

Of the four suitability alternatives for the segment, this alternative has the greatest potential for adverse effects to fisheries and water quality. Because of the higher potential for land disturbing activities along the river and in the wetland complex due to development, this alternative has the highest potential for soil erosion and resulting siltation within the segment. Increased siltation will result in lower hatch rates in spawning areas, reduce hiding cover for fish, and reduce aquatic invertebrate production, as well as raise water turbidity. These impacts will be reduced through mitigation measures in the ski area master plan which should also protect bank stability throughout the segment.

Development within the wetland complex would affect the hydrology of the meadow complex. The effects most likely to occur would be interruption of ground water flow through the complex by building foundations, road beds, and parking lots. This would result in an alteration of plant communities as a result of the altered flow conditions. The altered flow regime may also affect the streams ability to flush sediment which could further alter the flow regime. Development within the meadow complex would also introduce a large percentage of impervious surfaces that would effect the hydrology and function of the meadows. Altering the functioning of the meadow complex will lower the ability of the complex as well as the nearby stream to handle changes in water quality thus placing more stress on the dependant aquatic and biological community.

Higher numbers of visitors to the ski area and year-round use will likely increase the potential for water quality problems if the ability to treat sewage effectively is exceeded. Additionally, increased use will increase non-point source pollution from parking lots and snow removal operations due to greater numbers of vehicles and plowing and sanding activities to meet the needs of those vehicles.

The preliminary final alternative for the ski area will only allow low-level developments such as hiking trails in the wet meadow complex. If that ski area alternative is the final alternative selected, impacts will be very similar to alternative 2 below.

Alternative 2

In the SIA, only low impact facilities such as hiking trails would be allowed in the wet meadow area. These will be designed to interpret and protect the integrity of the wet meadow complex. Because of this, there is a greatly reduced potential for the majority of the negative

effects identified in alternative 1 above. Development can still take place outside the SIA, allowing year-round use. This would result in potential sewage and non-point source pollution similar to those mentioned in alternative 1. This potential can be greatly reduced through adequate mitigation measures incorporated into the ski area development plans.

Alternative 3

Development within 1/4 mile of the river would be limited to hiking trails, small parking areas and possibly portions of ski runs. The potential for soil erosion and resulting siltation is substantially reduced from alternative 2. The amount of reduction is dependent upon mitigation measures implemented required in the Wild and Scenic River management plan. Expansion activities would be limited to the Westside base area which would be dependent upon the final location of the Wild and Scenic River boundary. There may still be year round use but it will be substantially less than for alternatives 1 and 2 due to limitations on the area available for development. Consequently, effects from that year round use will also be less. Mitigation measures for the ski area development as set forth in the Wild and Scenic River management plan will require protection, and where possible, enhancement of water quality.

Alternative 4

Generally the same as alternative 3 with slightly less potential to impact fish habitat and water quality since few, if any, facilities other than hiking trails will be allowed in the river corridor.

Segment 3

Alternative 1

Of the four alternatives in the segment, this alternative has the greatest potential for adverse effects to fisheries and water quality. Because of the high level of timber harvest, there is a high potential for increased siltation from soil erosion resulting in effects from siltation similar to those described in segment 2, alternative 1. There is likely to be an increase in stream temperatures, especially if streamside trees are harvested. This potential is greatest on class IV tributaries where streamside buffers are minimal. Harvest of streamside trees will also lower the potential for recruitment of large woody debris as hiding cover for fish in the future as well as reduce bank stability from loss of root strength to hold soil in place from those trees harvested. Mitigation as required by Forest Plan standards and guides will reduce, but not completely eliminate, the effects described above.

Alternative 2

With reduced timber harvest, the potential for adverse impacts to fish habitat and water quality is lower than in alternative 1. Protection provided by Forest Plan standards and guides should protect water quality. Stream temperatures should not be raised by management activities. Recreation facilities along the river will be designed to protect water quality. There should be an adequate number of trees left in the riparian zone for adequate recruitment of large woody debris to the river. Development of structures for fish habitat improvement would improve the diversity of habitats available for fish species. Stream bank stability should not be adversely affected by management activities.

Alternative 3

With no timber harvest taking place along the river, non of the adverse effects described in alternatives 1 or 2 should take place.

Alternative 4

Effects would be the same as alternative 2.

Geologic Values

Geologic values along portions of the river in Segment 3 were one of the substantial resource values contributing to the outstandingly remarkable finding in the eligibility study for the river. The area along the river has a number of easily seen examples of geologic features associated with glaciation, volcanism, and examples of how the river has shaped the landscape.

Segment 2

Alternative 1

Along the river there should be no adverse visual or physical loss of the interpretive geologic features.

Alternative 2

Same as alternative 1.

Alternative 3

Same as alternative 1.

Alternative 4

Same as alternative 1.

Segment 3

Alternative 1

Along the river there should be no adverse visual or physical loss of the interpretive geologic features.

Alternative 2

Same as alternative 1.

Alternative 3

Same as alternative 1.

Alternative 4

Same as alternative 1.

Effects to Social Resources/Values

Recreational Values

Segment 2

The area along the river in this segment currently receives relatively low levels of dispersed recreational use. Primary use is during the summer months by hikers along the Umbrella Falls Trail #667 and Sahalie Falls Trail.

Alternative 1

Depending upon the amount of new development at Mt. Hood Meadows Ski area, there could be a large increase in the number of users along the river in the segment. Type of use will be dependent upon location of facilities along the river. If buildings for housing and lodges are developed within the corridor, there will be increased use along the river. Trails will be developed to accommodate use within the corridor. If overnight housing is approved in the ski area master plan, year round use will greatly increase within and adjacent to the river corridor above current use. Because of this, the ski area will be required to develop a summer recreation management plan to address and mitigate the impacts of the increased use in the area.

The recreational experience will be more of an urban type, especially the closer one is to the actual facilities. This is due to higher number of visitors and higher development level of facilities. If the preliminary preferred alternative for the ski area is implemented, only lower development level facilities such as hiking trails will be allowed in the wet meadow complex which will provide a more rural experience in that area. Use will still be high on those trails in the summer months if housing is approved. Even if housing is not approved, there will be an increase in day use along the Umbrella Falls trail with possible accompanying demand for additional trails in the area. This assumption is based on an increased demand for this type of activity close to the Portland Metropolitan area (reference State of Oregon Comprehensive Outdoor Recreation Plan 1988-1993).

There will be high potential for development of interpretive programs, both self guided and naturalist led to interpret the wetland complex. Those seeking a more primitive experience will likely be displaced to other areas on the Forest because of high numbers of users.

Alternative 2

Same as alternative 1 if the preliminary preferred ski area development alternative is adopted that limits development in the wet meadow complex to only low impact types of facilities such as hiking trails. Facilities in SIA will be designed to protect the integrity of the wet meadows as well as providing opportunity for interpreting the wet meadow values.

Alternative 3

Facilities along the river will be limited primarily to hiking trails and other low impact facilities in order to meet the VQO requirements for the Wild and Scenic River. There may be opportunities to develop some cross country/mountain bike trails in the corridor. Trails within the wet meadow complex will be designed to protect the integrity of the wet meadows as well as providing opportunities for interpreting the wet meadow values. If overnight housing is developed at the ski area, use within the river corridor will increase above current levels, especially during the summer season. If housing is approved, the ski area will be required to develop a summer recreation management plan to address and mitigate the impacts of the increased use in the area.

The area within the corridor will be managed for a roaded natural Recreation Opportunity Spectrum (ROS) class characterized by a generally natural environment with moderate evidence of sights and sounds of people. The experience should be similar, though possibly more crowded, than the current situation being experienced by users of the area. The additional crowding will be from increased demand for hiking opportunities as well as

visitors from the ski area, especially if overnight housing is developed.

Alternative 4

Similar to alternative 3. Only low development level facilities designed to protect or enhance river values, including the wet meadow complex, will be allowed in the river corridor. The corridor will be managed for a semi-primitive motorized ROS class with a predominately unmodified environment and a low concentration of users. Use will increase in the area, especially if overnight housing is developed at the ski area. Specific use restrictions may need to be implemented to manage for the semi-primitive experience.

Segment 3

Recreational values along portions of the river were one of the substantial resource values contributing to the outstandingly remarkable finding in the eligibility study for the river. The river area receives heavy fishing pressure during the summer months, primarily for native species as well as some anadromous species. There are two trails and two Forest Service campgrounds in the lower portion of the segment which receive moderately heavy summer use. Winter Nordic trails are located adjacent to and crossing the river in the upper portion of the segment. Use on these trails is increasing.

Alternative 1

Current ROS class of Roaded Natural with some Roaded Modified will move to a Roaded Modified throughout the entire segment. Several new roads will be developed to facilitate timber harvest which will increase dispersed motorized use opportunities such as dispersed motorized camping and OHV use. There will be a decrease in non-motorized dispersed camping opportunities. Because of increasing demand for hiking opportunities, use of existing trails will increase. Trail VQO standards will reduce adverse impacts to visual quality for trail users. It is unlikely that additional hiking trails will be developed because of impacts from timber harvest in locations where new trails would be built. There will be an increase in Nordic ski use and some new trails will be built in conjunction with some timber harvest units.

The recreational experience of those driving along State Highway 35 to view scenery will be reduced by modifications to landscape from timber harvest. Being close to the Portland metropolitan area as well as being part of the Mt. Hood Loop, the demand for this type of activity is high. There will be a decrease in semi-primitive recreation opportunities throughout the corridor and those seeking that type of experience will be dispaced to other areas of the Forest.

Alternative 2

The river area will be managed for a roaded natural ROS class, especially as viewed from State Highway 35 and throughout the B-9 allocation. Few, if any additional roads will be developed and roads in B-9 allocation may be closed after use to protect wildlife values causing a slight reduction in motorized camping and Off-Highway Vehicle (OHV) use along the upper end of the segment. OHV use may take place in the B-2 allocation if resource values are adequately protected. Existing campgrounds will remain and improved and additional sites may be developed if demand shows a need for such facilities and they can be constructed to protect resource values.

Day hiking use will increase due to increasing demand and additional trails may be built along the river to meet the demand. Additional Nordic skiing opportunities will be developed. Some of these opportunities may be developed in conjunction with timber sales.

Alternative 3

The area along the river will be managed for a roaded natural ROS class. OHV use will not be allowed. Existing developed sites will remain and may be expanded consistent with resource protection needs. No new sites will be developed along the river. A variety of summer and winter use trails may be developed as needed and resources allow. Trails will be designed to emphasize interpretation of old-growth values. There may also be opportunities to interpret cultural resource values if suitable sites are found.

Recreation use will increase due to increasing demand. Those seeking a more primitive recreation experience will still be able to find areas which will meet their expectations along the river.

Alternative 4

Very similar to alternative 2. Emphasis in developments in the Wild and Scenic River corridor will be to protect and enhance river values, including development of interpretive and other recreational opportunities.

Visual Quality

Visual quality objectives are to retain scenic values along State Highway 35 and high recreation use areas adjacent to the highway. The highway is part of the Mt. Hood Loop, is a potential scenic by-way and receives

heavy recreational use. While use is not heavy at this time in Segment 2, some ski area development alternatives have the potential to increase that use, raising the importance of visual quality as viewed from or immediately adjacent to the river. Because of this, visual quality was evaluated for both segments 2 and 3.

Segment 2

Alternative 1

Depending upon the level of ski area development, this alternative has the greatest potential to affect the visual quality along the river. Where high impact facilities such as housing, lodges, and parking lots are allowed, the forest will appear to be heavily altered in the visual foreground as viewed from or immediately adjacent to the river. In this alternative, development could take place within the wet meadow complex if impacts to the wetlands themselves can be adequately mitigated. The preliminary preferred alternative for the ski area development master plan will allow only low impact facilities such as hiking trails within the wet meadow complex and along most of the river. Additional support facilities for the ski area will likely be developed below the sewage treatment plant which will cause the forest to appear modified in the foreground as viewed from the river or any new trails along the river in that portion of the segment. The remainder of the corridor would have only low impact facilities such as trails which will be naturally appearing in the visual foreground.

As viewed from other areas of the Forest, any development that will take place within the ski area will meet the VQO of partial retention and the forest will appear slightly altered in those areas of development.

Alternative 2

Effects will be the same as alternative 1 if the preliminary preferred ski area development alternative is adopted that limits development in the wet meadow complex.

Alternative 3

With a VQO of partial retention throughout the entire river corridor as viewed from or immediately adjacent to the river, the area in the foreground around any facility development will appear slightly altered. Because of topographic screening in the river corridor, there should be little development along the river and the forest will likely be naturally appearing throughout the segment as viewed from the river.

Alternative 4

With a VQO of retention throughout the river corridor, the area will be naturally appearing throughout the segment.

Segment 3

Alternative 1

With a VQO of modification foreground, middleground, and background as the standard for this segment, the landscape will appear moderately to heavily altered from the river, State Highway 35, and other heavy use recreational areas.

Alternative 2

With a VQO of retention foreground/partial retention middleground and background as the standard, landscape will be naturally appearing in the foreground and slightly altered in the background as viewed from State Highway 35 and other heavy use recreational areas.

Alternative 3

Along the river the VQO is preservation foreground/middleground/background and the landscape in the future should have an unaltered appearance as viewed from State Highway 35 and other heavy use recreational areas.

Alternative 4

With a VQO of partial retention foreground, landscape will appear slightly altered in the foreground as viewed from State Highway 35 and other heavy use recreational areas. Appearance outside of the river corridor will be dependent upon final allocations outside the corridor.

Consequences to Mt. Hood Meadows Ski Area

The East Fork of Hood River flows through the Mt. Hood Meadows Ski Area. The ski area is currently considering expansion of existing facilities to provide additional skiing opportunities. Alternatives being considered as part of the expansion include development of overnight housing and associated facilities within the ski area permit boundary. Some of ski area development alternatives propose construction of facilities within the river corridor in segment 2. Wild and Scenic River designation would restrict proposed expansion activities in those alternatives in order to protect the wet meadow complex and other river related values. Because of the

possible conflict between protection of river values and ski area development, effects to the ski area as a result of designation were evaluated.

Since only segment 2 of the river is within the ski area boundary, effects to the ski area are only evaluated for this segment.

Alternative 1

Existing operations would continue as in the past consistent with the ski area operating plan. This alternative allows maximum flexibility for expansion alternatives in the ski area master plan development. Ski area facilities have the greatest potential to be designed to meet the functional needs of skiers by reducing the amount of additional walking between lodges and lifts, etc. Facilities could be allowed within the meadow complex, but development actually impacting the wetlands would require a Wetland Fill Permit from the U.S. Army Corps of Engineers as required under the Clean Water Act. E.O. 11990 would require mitigation by the ski area if wetlands are adversely impacted. This alternative provides the greatest opportunity for expanding economic return to the ski area.

The preliminary preferred alternative for the ski area master plan would not construct facilities other than hiking trails or similar low impact facilities in the wet meadow complex. If this ski area alternative is selected, effects to the river corridor would be very similar to those that are listed in alternative 2 below.

Alternative 2

Existing operations would continue as they have in the past consistent with the ski area operating plan. Ski area expansion opportunities are limited by not allowing expansion into the SIA. New facilities such as overnight housing, ski lodges, roads, parking areas, ski runs, and lifts can be developed outside the SIA. Meeting some of the functional needs of skiers is limited since facilities will not be built in the SIA. Skiers will be required to walk to some lift loading areas, lodges, etc. that they could have skied to if facilities were in the SIA. There is still opportunity to increase economic return to the ski area above current levels since it will still be feasible to expand operations outside SIA. This opportunity will be less than alternative 1 since expansion activities are allowed only outside SIA.

Alternative 3

Existing operations would continue as they have in the past consistent with the ski area operating plan as long as current water quality is protected. Expansion of the ski area facilities within the river corridor would be severely limited. Some facilities may be allowed such as small parking areas or ski runs within the corridor consistent with meeting VQO and other requirements. Dependent upon location of the final river corridor boundary, the proposed Westside base for the ski area could be developed if its development would not reduce water quality. There may be limitations on summer use if the ski area sewage treatment facility would not meet demand and protect current water quality. If the river were designated, expansion in the remainder of the permit area would be limited if the water quality of tributaries would affect water quality in mainstem of river. Opportunity to expand economic return to the ski area would be limited.

Alternative 4

Same as alternative 3 but more restrictive on allowing facilities within the river corridor because of more restrictive visual requirements. Minimal ski area expansion would be allowed because of lack of adequate area for parking, lifts, and other facilities and need to meet water quality requirements. Minimal opportunity to expand economic return to the ski area are available. Opportunity to expand economic return would be more limited than Alternative 3.

Consequences to Timber Harvest

Segment 2

There are four acres of suitable timberland adjacent to Highway 35 in this segment. All 4 alternatives for this segment do not allow regulated timber harvest. Harvest for salvage and ski area development will be allowed. Because regulated timber harvest is not allowed in this segment, effects to timber harvest is not evaluated for the segment.

Segment 3

Of the 4144 acres within the segment, approximately 79% is suitable for timber harvest. The remaining acreage is considered unsuitable due to being either non-forest or difficult to regenerate classifications. Species composition within the corridor is either of the pacific silver fir type or mixed conifer type with a small amount of mountain hemlock type.

- Estimated Total Standing Timber = 120.8 MMBF
- Estimated Potential annual ASQ (Intensive Timber Management) = 1.990 MMBF

Alternative 1

Intensive timber management within MMRs for maximum timber outputs under C-1 allocation will be allowed.

This alternative would contribute an estimated 1.990 MMBF to the annual ASQ.

Alternative 2

Regulated harvest would be allowed at a reduced level to meet visual and wildlife objectives. Rotation would be extended to 250 years with uneven-aged management.

This alternative would contribute an estimated 1.373 MMBF to the annual ASQ. This is a reduction of .617 MMBF, or 31 % reduction of maximum annual ASQ for the river corridor.

Alternative 3

Regulated harvest would not be allowed along the length of the river corridor and no timber harvest volume would be contributed to the annual ASQ.

Alternative 4

Regulated harvest would be allowed at a reduced rate to protect and/or enhance river related values.

This alternative would contribute an estimated 1.360 MMBF to the annual ASQ. This is a reduction of .630 MMBF, or 32% reduction from alternative 1. The difference between this alternative and alternative 2 is negligible.

Cultural Resources and Native American Uses

The Mt. Hood National Forest coordinates with the Confederated Tribes of the Warm Springs Reservation in accordance with the National Environmental Policy Act, the National Historic Preservation Act of 1966, as amended, the American Indian Religious Freedom Act, and other federal regulations. Under the Tribes of Middle Oregon Treaty of 1855, the Forest Service is responsible to honor specific treaty rights within lands ceded to the U.S. Government. On the Mt. Hood these lands fall east of the Cascade summit and include the East Fork.

These rights include the taking of fish, wildlife, and plants for personal use and religious purposes. The Confederated Tribes have stated that the area along the river and especially the stringer meadows area is important to their history and traditional uses. There is a concern that proposed management activities along the river in both segments could affect the resources which tribe members have access to through the treaty rights. Some potential impacts of particular concern are access to traditional use areas, impacts to water quality and its effect on fish populations and habitat, and impacts on game species.

There are no known cultural resources identified in segment 2 of the river and one historic cultural resource site identified in segment 3. For all alternatives, prior to implementation of any project, specific on-the-ground surveys must be conducted to identify any cultural resources in the area. Any identified resources must be protected until they have been professionally evaluated and, if found significant, management guidelines established for them.

Segment 2

Alternative 1

Of all alternatives for the segment, this alternative has the greatest potential to affect treaty rights because of the potential for development in and around the culturally important stringer meadows area as well as development along the river. Use is expected to increase in the area from an increasing demand for day use hiking. If overnight housing is developed at the ski area, use will also increase from those visitors. This higher use of the meadow area by non-Native American visitors may cause tribal members to feel inhibited to use the area for traditional uses. Actual development in or immediately adjacent to the meadows will have a relatively high potential to degrade water quality which could affect downstream fishery values and hydrologic characteristics of the meadow which could disturb or change plant communities important for traditional Native American uses. High use levels along the river will also displace important big game wildlife species.

Development activities in the area have the potential to impact cultural resources in the river corridor. This alternative has the greatest potential to impact those resources because of its development and land disturbance in the river corridor. These impacts can be mitigated or avoided by adequate project design, location, and monitoring. Mitigation may require that projects or portions of projects not be implemented.

The preliminary preferred alternative for the ski area will not construct facilities other than hiking trails or similar low impact facilities in the wet meadow complex. If this ski area alternative is to be implemented, then effects would be very similar to those listed in alternative 2.

Alternative 2

Actual physical impacts to the meadow complex would be much more limited than those described in alternative 1 because only low impact type facilities such as hiking trails would be allowed in the wet meadow complex. The management plan for the Special Interest Area will provide direction on facility placement and designed to protect the meadow values. This will allow the opportunity to direct some use away from areas most important to Native Americans. In areas of high use, some plants important to Native American use may be impacted through trampling or picking by other visitors in the area. There still could be a relatively high level of use by non-Native American visitors in portions of the meadow area, both from increasing demand for day hiking opportunities and from ski area visitors using overnight housing, if developed. This could cause tribal members to feel inhibited to use the area for traditional uses. Because interpretation of meadow values is part of the SIA, there will be the opportunity to develop interpretive messages highlighting the importance of the meadows and surrounding areas to Native American peoples, thereby promoting a better understanding of their lifestyles.

Development activities in the area have the potential to impact cultural resources in the river corridor. Because of the limited development within the meadow complex and limited opportunities to develop other facilities along the river below the meadows, potential to impact those resources is much less than alternative 1. These impacts can be mitigated or avoided by adequate project design, location, and monitoring. Mitigation may require that projects or portions of projects not be implemented.

Alternative 3

Impacts would be slightly less than alternative 2. Management of and impacts to the stringer meadows area would be similar to its management as a SIA. A comprehensive management plan for the entire river would further limit development activities below the stringer meadows area reducing any impacts in that portion of the segment. These additional limitations in the lower segment would likely reduce the numbers of visitors in that portion of the segment, giving better protection to soils and vegetation and causing less disturbance of important wildlife species, thereby better meeting the desires of Native Americans who may want to use the area.

Alternative 4

Impacts would be very similar to alternative 2, though slightly more restrictive in the lower portion of the segment, since restrictions on development will be more limiting in the Scenic classification than in the Recreational classification in alternative 3.

Segment 3

Alternative 1

Because of the high level of ground disturbing activities in the segment from intensive timber harvest, this alternative has the greatest potential to disturb a variety of plant communities and other areas of that are of historical importance to Native Americans. Disturbance of areas that are important for elk rearing/deer fawning can potentially reduce numbers of these animals important to Native Americans.

This alternative also has the greatest potential to impact cultural resources due to high level of ground disturbing activities. These impacts can be mitigated or avoided by adequate project design, location, and monitoring. Mitigation may require that projects or portions of projects not be implemented.

Alternative 2

Most values of importance to Native Americans will be protected. Habitat critical to wildlife species would be protected, and in locations, enhanced. Some harvesting and other land disturbing activities will take place that have the potential to impact cultural resources but these impacts can be mitigated or avoided by adequate project design, location and monitoring. Mitigation may require that projects or portions of projects not be implemented.

Alternative 3

With no timber harvest taking place along the river, potential to impact cultural resources would be very low.

Alternative 4

Same as alternative 2

Water Rights

A concern was expressed by water users outside the Forest boundary that Wild and Scenic River designation would adversely affect their existing and future water rights and uses. Wild and Scenic designation for the portion of river on the Forest would not have any effect to water rights off the Forest, existing or future since

those rights exist below the portion that would be designated. Even if designation were to extend off the Forest, existing water rights would not be affected. If designation were to extend off the Forest, future water rights could be affected if it could be shown that granting those rights would adversely affect the values for which the river was set aside.

Wild and Scenic designation would not affect the small diversion to supply water for laboratory analysis at the Mt. Hood Meadows Treatment plant. Designation on the Forest could affect future water rights if it could be shown that granting those rights would adversely affect the values for which the river was set aside.

Funding Needs if Classified as a Wild and Scenic River

The following are the expected funding requirements for the East Fork Hood River for the next five years:

Table E-5 Funding Requirements for the East Fork Hood River

	Expenses Expected Independent of Wild and Scenic Designation	Additional Expenses Expected With Wild and Scenic Designation
General Administration	18,000	0
Costs of Implementation	0	10,000
Development of Management Plan	20,000[1]	60,000[2]
Development Costs	617,000[3]	5,000
Operation and Maintenance Costs	44,500	1,000
Total - First Five Years	699,500	76,000

General administration and operation and maintenance costs are estimated to continue at $9,000 annually.

[1]*Cost of development of Special Interest Plan for stringer meadows area.*

[2]*Additional cost of development of Wild and Scenic River management Plan. Total cost for management plan is estimated at $70,000.*

[3]*Estimated cost of addition of 30 unit campground and converting one existing campground to rest stop/picnic area only. This development is planned to take place independent of Wild and Scenic designation.*

Appendix F

Management Requirements

Appendix F
Management Requirements

Appendix F - Management Requirements

Introduction

This appendix is included in the Final Environmental Impact Statement for the Forest Plan in response to decisions of the Chief of the Forest Service and the Deputy Assistant Secretary of Agriculture regarding appeal No. 1770, brought by the Northwest Forest Resource Council on September 18, 1986. The appeal centered on direction from the Regional Forester to incorporate "minimum management requirements" (MMRs) in forest plan alternatives. The appellant requested that the appropriateness of the MMRs be examined through the environmental impact statement process. The information in this appendix also responds to comments about Management Requirements that were raised during the review of the Draft Environmental Impact Statement.

A summary of Management Requirements is provided in Chapter II, "Management Requirements" section. Additional modeling information is in Appendix B. The Standards and Guidelines (or specifications) for implementation of the management requirements are found in the Forest Plan.

This appendix addresses the issue raised by the appellant: For those management requirements which cause significant reductions in allowable sale quantity (ASQ) or present net value (PNV), alternate ways of meeting the management requirements are examined and their opportunity costs (reductions in ASQ and PNV) are compared.

Appendix G of the Draft Environmental Impact Statement, "Sensitivity Analysis for Minimum Management Requirements" has been completely replaced by the material presented here. The Appendix G of the Draft is part of the planning record.

Background of Management Requirements

What are Management Requirements?

Many laws and regulations guide Forest Service activities. One law in particular, the National Forest Management Act of 1976 (NFMA), and its implementing regulations provide direction for the Forest planning process. The direction for National Forest Systems Land and Resource Management Planning, in Section 36 of the Code of Federal Regulations, Part 219 [36 CFR] specify:

- The minimum specific management requirements to be met in accomplishing the goals and objectives of the National Forest System [36 CFR 219.27].
- The minimum requirements for integrating individual forest resource planning into the Forest Plan [36 CFR 219.14 through 219.26].

The term management requirements (MR's) will be used in this appendix to refer to these NFMA regulations instead of minimum management requirements (MMRs) which were used in the Draft Environmental Impact Statement and Proposed Forest Plan.

Some management requirements are procedural in nature and need not be dealt with here. Some requirements were analyzed and were available for review during the Regional Guide Environmental Impact Statement process and are not dealt with here. The management requirements which have not been fully dealt with elsewhere, and which require additional analysis due to sig-

nificant opportunity costs associated with implementation are:

- Maintenance of habitat to assure viable populations of fish and wildlife populations particularly mature and old growth habitat.
- Protection of water resources, particularly water temperatures.

These management requirements are described in greater detail in later sections of this appendix. MR's for dispersal of created openings, other wildlife habitats and other requirements noted in 36 CFR 219.27 which have not been addressed in other Environmental Impact Statements do not cause significant opportunity costs when implemented.

Legal Requirements Versus Implementation Methods

The management requirements from NFMA and its implementing regulations are legal requirements. They represent "ends" which must be met during forest plan implementation. For example, the NFMA implementing regulations require that "fish and wildlife habitat shall be managed to maintain viable populations of existing and desired non-native vertebrate species in the planning area." It is mandatory that, whatever implementation methods are chosen, the management requirement be met.

Specifications or standards for achievement for each management requirement are established at the national level or through analysis at the regional level for most of the management requirements. These are listed in the regulations or as Standards and Guidelines in the Regional Guide. Additional specifications identified on the Forest are listed as Standards and Guidelines in the FEIS, Appendix D, and the Land and Resource Management Plan (Forest Plan), Chapter IV. The specifications must be based on knowledge of the resources involved. For example, in meeting the management requirement for viable populations of vertebrate species it is necessary to define the type of habitat required by the species, the maximum distance between habitats which will still provide reasonable assurance of genetic interaction, and the size of habitat area needed to support a breeding pair.

Often, the pool of scientific knowledge is insufficient to provide the entire basis for defining the specific conditions or standards that will satisfy or meet a management requirement. When this happens it is necessary to rely on the field experience and the professional judgement of knowledgeable professionals and to establish monitoring and research that will provide better information for future planning efforts.

Implementation methods are the means or ways in which the management requirements will be met. Usually there is more than one way in which a management requirement can be met. Determining the most appropriate means of meeting the specifications for each management requirement involves careful analysis at the Forest level. Considering and analyzing different means or ways of meeting a specific management requirement are particularly important if there are potentially significant reductions in present net worth (PNV) or allowable sale quantity (ASQ) involved.

How Implementation Methods to Meet the Management Requirement are Developed

The selection of means sufficient to meet management requirements is based on effectiveness in meeting resource protection and on minimizing reductions to PNV or ASQ. The general process used in evaluating alternative ways of meeting the management requirements is as follows:

- Identify the desired end for each management requirement.
- Assemble existing information about the resources addressed by the management requirement.
- Analyze the existing information to determine what conditions or specifications need to exist on-the-ground to assure meeting the "ends" of the management requirement (see Table F-1).
- Develop various ways or means to meet the management requirement. (see Table F-2).
- Evaluate the effectiveness of the alternative means in meeting the management requirements. Estimate the environmental effects of each set of means.
- For each set of means, estimate the effects on economic efficiency (as measured by changes in present net value) and the effects on timber availability (as measured by allowable sale quantity).
- When a reduction of Present Net Value (PNV) or Allowable Sale Quantity (ASQ) exceeds two percent of the present net value benchmark, the analysis used to select the means are presented. Two percent was used because differences less than two percent would not be significant in

terms of PNV or ASQ. A higher threshold would preclude evaluation of many alternatives.

In order to provide protection for water quality and wildlife habitat on Mt. Hood National Forest land, some opportunities to maximize present net value or to maximize timber production may have to be foregone.

Discussions are grouped by water quality management requirements and by wildlife management requirements in separate sections. In each section, the management requirements are displayed along with relevant specifications from national and regional guidelines, and alternative implementation methods (means or ways) are analyzed.

Table F-1 summarizes each of the management requirements (ends) subject to analysis of opportunity costs on the Mt. Hood National Forest and summarizes the specifications or standards of achievement for those ends. Table F-2 shows the alternative means considered for implementing each management requirement where the opportunity costs exceeded two percent.

Table F-1 Summary of Management Requirements and Associated Specifications

Ends	Summary of Specifications
Protect Water Quality	Temperature increases of two degrees Fahrenheit or less.
Habitat provided that maintains viable populations of existing native and nonnative vertebrate species.	For pileated woodpecker and pine marten: Maintain mature conifer stands (for nesting and feeding) of adequate size and distribution to permit interaction breeding pairs of dependent species (see Tables F-6 and F-7). For Northern Spotted Owl: Maintain old growth conifer stands (for nesting and feeding) of adequate size and distribution to permit interaction among breeding pairs of dependent species.

Table F-2 Summary of Alternative Means Considered for Implementing Each Management Requirement

Management Requirements	Alternative Means
Protect streams and streambanks	1. Set aside streamside streambanks vegetation (no scheduled timber harvest). 2. Selective harvest of streamside vegetation (scheduled timber harvest).
Provide for adequate habitat to maintain viable populations of existing native and desired non-native vertebrate species.	For pileated woodpecker and pine marten: 1. Dedicate habitat sites for no timber harvest. 2. Manage habitat sites on 250-year rotations. For Northern Spotted Owl: 1. Dedicate habitat sites for no timber harvest. 2. Manage habitat sites on 300-year rotations.

In analyzing the effects of the alternative means of meeting the MR's on present net value (PNV) and allowable sale quantity (ASQ), FORPLAN runs were made with and without constraints designed to simulate meeting the management requirement. The PNV benchmark was used for this analysis. This benchmark is a FORPLAN run which identifies the mix of management activities which would result in the highest level of economic efficiency (i.e., the highest PNV) in managing Mt. Hood National Forest resources. It also identifies the ASQ associated with the most economically-efficient mix of management activities.

A benchmark was chosen to use in the with and without constraint comparison, rather than an issue-based Forest Plan alternative, because management practices necessary to meet other objectives of the issue-based alternatives may partially or fully meet the MR, thus clouding any analysis of PNV or ASQ effects induced by the management requirement. The true effect when measured against a fully developed alternative is significantly less because the objectives of that alternative may satisfy the management requirements to a large extent.

Implementation Methods with High Opportunity Costs

Table F-3 displays the PNV and ASQ effects of the implementation measures selected for meeting management requirements on the Mt. Hood National Forest. Only those implementation measures with effects of two percent or larger are shown: water quality, mature conifer (for pileated woodpecker and pine marten) and old-growth conifer (for spotted owl).

Implementation Methods With Low Opportunity Costs

Management requirements for other wildlife habitat requirements for threatened and endangered species, sensitive species (except spotted owl), and special habitats are not addressed in this analysis because effects of providing sufficient habitat to maintain viable populations are less than two percent.

Implementation Methods That Meet More Than One Management Requirements

Implementation methods selected to meet water quality management requirements also provide fish habitat in streams and riparian habitat adjacent to streams to assure the maintenance of viable populations of species dependent on these habitats. In addition, the water quality implementation methods meet the harvest dispersion management requirement. Alternative implementation methods for meeting water quality management requirements will also meet fish habitat and riparian habitat requirements. No additional discussion or analysis is displayed in Appendix F for these management requirements.

Water Quality Management Requirements

Source of the Water Quality Managements Requirements

Management requirements for water quality are based on NFMA which states: Forest planning shall provide for compliance with requirements of the Clean Water Act, the Safe Drinking Water Act, and all substantive and procedural requirements of Federal, State, and local governmental bodies with respect to the provision of

Table F-3 Impacts of Meeting the Management Requirements with the Selected Implementation

Selected Implementation Method	First Decade ASQ (MMBF/Year)	Changes in ASQ	LTSYC (MMCF/Year)	Changes in LTSYC	PNV (MM$)	Changes in PNV
PNV Benchmark with no protection measures	421	-	69	-	1,352	-
Opportunity cost of water quality	364	14%	59	14%	1,149	15%
Impact of maintaining mature conifer habitat for pileated woodpecker and pine marten	395	6%	65	6%	1,248	8%
Impact of maintaining mature conifer and old growth habitat for spotted owl	381	10%	62	9%	1,202	11%

public water systems and the disposal of waste water [36 CFR 219.23(d)].

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. This area shall correspond to at least the recognizable area dominated by the riparian vegetation. 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 Clean Water Act seeks to control nonpoint sources of water pollution. To comply with Section 208 of the Act, Forest Service Region Six, the states of Oregon and Washington (which manage implementation of the Act in the respective states), and the Environmental Protection Agency agreed on a process whereby each state reviews Forest Service management practices to determine if they meet or exceed state water quality standards. Practices that are judged to meet or exceed the standards are certified as Best Management Practices (BMPs) which the Forest Service then agrees to continue.

Specifications for the Water Quality Management Requirements

State of Oregon water quality standards (Oregon Administrative Rules 340-41-205 through 325) provide specifications to be met by implementation methods selected by the Forest. They are summarized below:

- Dissolved oxygen concentration shall not be less than 90 percent of saturation at the seasonal low, or less than 95 percent of saturation in spawning areas, during spawning, incubation, hatching, and fry stages of salmonid fishes.
- No measurable increases shall be allowed...when stream temperatures are 58 degrees Fahrenheit or greater...or more than two degrees Fahrenheit increase due to all sources combined when stream temperatures are 56 degrees Fahrenheit or less...
- No more than a 10 percent cumulative increase in natural stream turbidity shall be allowed, as measured relative to a control point immediately upstream of the turbidity-causing activity.
- pH values shall not fall outside...6.5 to 8.5.

On the Mt. Hood National Forest, most of the activities which affect water quality are related to timber harvesting. They include removal of trees, road construction, and burning of brush and organic debris. (For more discussion, see FEIS, Chapter IV, "Soil and Water" section).

The primary approach to maintaining water quality on Mt. Hood National Forest lands is to: (1) limit or prohibit timber harvest on certain unstable slopes (by designating such lands as unsuitable for timber production), (2) disperse timber harvest through time and space to avoid potential for cumulative impacts, and (3) on lands designated suitable for timber production, maintain sufficient shade producing vegetation along stream banks to maintain stream temperatures within acceptable limits.

In the FEIS, the specifications established by the Forest are called Standards and Guidelines. The required watershed condition, and the standards that indicate achievement of the water quality management requirement, are described in the Land and Resource Management Plan, Chapter IV. The following specifications are addressed in this appendix.

Riparian Area Standard and Guideline

Maintain Stream Temperatures. (Any increase in summer stream temperatures would violate Oregon State Water Quality Standards.)

Alternative Ways of Meeting the Management Requirements for Water Quality

Alternative ways for the meeting specifications shown above could be modeled in FORPLAN to simulate the required end conditions. These become alternative constraints in the model that set limits on how FORPLAN schedules timber harvest to maximize PNV. FORPLAN constraints are discussed in Appendix B of the FEIS. The following alternatives were considered:

Alternatives Considered in Detail

Alternative 1: Set-aside Shade Producing Streamside Vegetation (No Scheduled Timber Harvest)

This alternative is designed to minimize vegetation disturbance and schedules no timber harvest in riparian areas. No shade providing vegetation would be removed by timber harvest in riparian areas.

Alternative 2: Selective Harvest of Shade Producing Streamside vegetation (scheduled Timber Harvest)

This alternative allows a moderate level of removal of shade producing vegetation from the riparian area while maintaining existing stream water temperatures. This requires the regrowth of shade producing vegetation (previously removed as a result of past activities) to balance removal associated with new projects.

FORPLAN allowed harvesting on only 20 percent of the estimated riparian acres. These acres are harvested using the rotation ages of adjacent stands. Implementation of this MR allows flexibility in the volume removed from any acre. The only requirement is that the volume removed from the entire riparian area should not exceed 20 percent of the total volume produced over a rotation.

Evaluation of Implementation Methods to Meet Water Quality Management Requirements

Either of the alternative means or implementation methods noted above would meet management requirements and warranted more detailed analysis.

Tradeoff Analysis

The impacts of the alternative methods for meeting water quality management requirements were estimated by comparing the differences in PNV and timber outputs that would occur with and without the constraints that simulate the means for accomplishing the required condition.

Table F-4 compares the first decade ASQ, LTSYC, and PNV of the alternative implementation methods (means) for water quality protection.

Consequences of Alternative Ways or Means of Meeting Water Quality

The impact on PNV and timber outputs of the option of removing no vegetation from the riparian areas is approximately four percent greater than the moderate shade removal alternative. This alternative would go beyond meeting the requirement of protecting stream temperatures; over time, the temperature would be enhanced (lowered) as more shade would be provided. In those basins where past activities have removed substantial shade producing vegetation along streams, the no vegetative removal alternative could enhance fish habitat.

Rationale for the Selected Implementation Means

Implementation methods (means) for meeting the management requirements for water quality are based on practices that existed before the NFMA regulations. Consequently, interpretations and processes for meeting these requirements are already established on the ground.

Alternative 2 represents current practices consistent with the Mt. Hood riparian policy. This policy has evolved over a number of years incorporating results of scientific research as methodology and expertise become available. The stream temperature modeling has been facilitated by work pioneered on this Forest using a solar pathfinder to correlate changes in the vegetation (growth or removal) with changes in actual stream shade during critical times of the year. The riparian policy has developed with the involvement of experienced resource professionals from all disciplines and has been the object of numerous field reviews attended by professionals from all levels of the Forest Service, as well as university faculty members, representatives from the timber industry, the State of Oregon, and other interested publics. The Mt. Hood's riparian policy and streamside management are considered state-of-the-art in multiple-use management in an area with high resource values and conflicting interests.

By implementing Alternative 2 the Forest would meet state water quality standards throughout the planning period while minimizing PNV and ASQ opportunity costs.

Implications for Forest Plan Alternatives

FEIS Chapter II and Appendix B discuss the effects of this alternative way of meeting water quality requirements in FEIS alternatives. The analysis results of selected means of water quality protection are shown in Table F-4. The effects of each alternative approach are evaluated in terms of ASQ, LTSYC, and PNV. Actual Plan alternatives will have somewhat less opportunity costs as overlaps from lands withdrawn for wildlife, scenery, recreation or other nontimber objectives will help to provide shade producing vegetation.

Role of Monitoring and Research

The assumption that leaving shade producing vegetation on riparian areas in necessary to maintain viable populations of fish is based on extensive research that describes the importance of water temperature for water quality and habitat.

Table F-4 Analysis Results of Alternative Means for Meeting the Water Quality Management Requirements

	First Decade ASQ (MMBF/year)	Changes in ASQ	LTSYC (MMCF/year)	Changes in LTSYC	PNV (MM$)	Changes in PNV
PNV Benchmark with no protection measures	421	-	69	-	1,352	-
PNV Benchmark using alternative 1 (no vegetative removal) to meet water quality management requirement	349	17%	57	17%	1,102	18%
PNV Benchmark using alternative 2 (moderate vegetative removal) to meet water quality management requirement	364	14%	59	14%	1,149	15%

Continued monitoring will be done on water temperature fluctuations due to removal and growth of stream shade producing vegetation. See the Forest Plan monitoring program.

Management Requirement for Viable Populations of Existing Native Vertebrate Species

Source of the Management Requirement

The NFMA regulations require that:

"Fish and wildlife habitat shall be managed to maintain viable populations of existing native and desired non-native vertebrate species in the planning area. For planning purposes, a viable population shall be regarded as one which has the estimated numbers and distribution of reproductive individuals to insure continued existence in the planning area. In order to insure that viable populations will be maintained, habitat must be provided to support, at least, a minimum number of reproductive individuals and that habitat must be well distributed so that those individuals can interact with others in the planning area." (36 CFR 219.19).

Description of the Management Requirement

Within Region Six, habitats types that were likely to be limited in the future (i.e. in short supply either in total acreage or in distribution) were identified along with Federally listed threatened and endangered species habitats. Following identification of vulnerable habitats, all vertebrate species in the Region were assessed with regard to population numbers and/or distribution that could result in extinction during the next decade. Species with the greatest dependency on limited habitats were then identified. Identification of these "key vulnerable species" was done on a subregional basis, recognizing the variability of situations within the Region. Once key species were identified, the Region defined their habitat requirements and biological characteristics . These species are included in the list of Management Indicator Species (MIS) that all Forests in the Region address in forest planning and subsequent monitoring.

Table F-5 displays current Regional direction regarding limited habitats and wildlife species by sub-regional zones. The Mt. Hood National Forest is in Zone II (mountain goat not included).

Northern spotted owl, pileated woodpecker and pine marten are the only species for which alternative ways of

Table F-5 Species Matrix for Addressing Management Indicator Species and Threatened and Endangered Species

Zone Habitat	Zone 1 North Coastal	Zone 2 Westside Cascades	Zone 3 Eastside Cascades	Zone 4 Blue Mountains
Mature and Old Growth (Seral Stages V and VI)	*Northern Spotted Owl Pine Marten Pileated Woodpecker	*Northern Spotted Owl Pine Marten Pileated Woodpecker	*Northern Spotted Owl Pine Marten Pileated Woodpecker Northern three-toed Woodpecker	Pine Marten Pileated Woodpecker Northern three-toed Woodpecker
	*The Final Supplemental Environmental Impact Statement and subsequent Record of Decision provide direction for management of spotted owl habitat in Region Six.			
Dead and Defective	Primary Cavity Excavators	Primary Cavity Excavators	Primary Cavity Excavators	Primary Cavity Excavators
Riparian	The Forest determined and documented as part of the planning records, whether it needed to address wildlife in addition to fish, and if so which wildlife species would represent the riparian habitat. Coordination of this process with adjacent Forests was necessary to determine consistency.			
Big Game		Roosevelt Elk Black-tailed Deer Mountain Goat (Gifford Pinchot, Mt. Baker-Snoq.)	Mountain Goat (Wenatchee)	
Threatened and Endangered Species	Bald Eagle Peregrine Falcon Brown Pelican Aleutian Canada Goose	Bald Eagle Peregrine Falcon	Bald Eagle Peregrine Falcon Grizzly Bear Woodland Caribou (Colville)	Bald Eagle Peregrine Falcon

meeting management requirements are evaluated. Separate management requirements were developed for these species because their viability would be at risk if no management actions were taken to protect their habitats.

Management requirements for threatened and endangered species, sensitive species (except spotted owl), and special habitats are not addressed in this analysis because reductions in PNV and ASQ are less than two percent. The management requirements for fish are met with the same management practices which provide the requirements for water quality and riparian area management, therefore further analysis is not provided.

Habitat Needs

Habitat needs were defined using information from existing research whenever possible (see bibliography). This information was used to define the habitat conditions, dispersal distances, and habitat size necessary to meet the management requirement. When information was available, but did not fit exactly the management requirement context, professional judgement was used to apply the information in estimating habitat needs. When information was not available, habitat needs were developed using professional judgment of a number of the more knowledgeable biologists on the subject. Information from existing research was used whenever possible (Note: Habitat needs of spotted owls are described in the Final Supplement to the Environmental Impact Statement for an Amendment to the Pacific Northwest Regional Guide, USDA Forest Service 1988).

These are the basis for providing habitat and also for deciding how best to represent the species' needs in the planning process and in the FORPLAN Model.

Specific information on habitat needs, specifications for meeting habitat requirements, and alternative ways of meeting the management requirements for pine marten, pileated woodpecker, and spotted owls are presented in the following sections. For each species, information is provided for these three habitat factors:

Principal Habitats Used

Information about the seral stages and Kuchler vegetation types which are used by the various species is documented in many research papers for individual species. Information as to which Kuchler type and/or seral stage are primary or secondary habitat, and the amount of dependency upon each habitat, is based mostly on professional judgment (Guenther and Kucera 1978, Phillips and others, 1981).

Dispersal Distance Between Habitats

The guideline on distribution of habitat areas is intended to establish a network that allows individuals of a species to successfully disperse to adjacent habitat areas. This provides interactions among individuals and prevents isolation of sub-populations. This guideline is called the dispersal distance. Research information alone is generally not adequate to establish reasonable dispersal distances between habitats. As a result, dispersal distance is often determined on the basis of observations, experience, and professional judgement. In establishing the network of habitat areas for each species, consideration is given to habitats in reserved areas and to habitat areas being established for other species.

Size of Habitat Areas

The size of individual habitat areas provided for each wildlife species is based on the habitat acreage needed to support the basic social or reproductive unit of the species, i.e. breeding pairs. Both home range and species density information are used to estimate the needed size of habitat area. This was supplemented with professional judgement where no data were available for the specific habitat types being managed.

Specifications for Meeting Habitat Requirements for Pileated Woodpecker and Pine Marten

Approximately 40-50 wildlife species are known to depend on or prefer mature conifer habitat during some part of their life cycle on the Mt. Hood National Forest. By providing a dispersion of mature conifer habitat sites for the pileated woodpecker and pine marten, we are assuming that the other species preferring mature conifer habitats will have adequate habitat to maintain viable populations throughout the planning period.

Regional specifications for pileated woodpecker and pine marten are discussed in the following sections. The specifications are summarized from "A Report on Minimum Management Requirements for Forest Planning on the National Forests of the Pacific Northwest Region, USDA Forest Service" (USDA Forest Service, June 1986). In developing the report, various habitat sizes and dispersal distances were considered. Based on that analysis, minimum habitat sizes and maximum dispersal distances were identified for each species. This information is based on the best available data. Alternatives which addressed changes to size or distribution were not considered in developing the Forest Plan for the Mt. Hood National Forest.

Habitat specifications for pileated woodpecker and pine marten are summarized in Tables F-6 and F-7.

Pileated Woodpecker Specifications

Principal Habitats Used

Pileated woodpeckers need mature or old growth stands of timber for nesting and feeding. Habitats were identified in Bull and Meslow (1977), Guenther and others (1978), and Thomas (1979).

Dispersal Distance Between Habitats

An initial five-mile maximum dispersal distance between habitats resulted from professional judgment documented in Phillips and Roberts (1985). In June of 1986, the distance between habitats was modified to one habitat area for every 12,000 to 13,000 acres (about five miles apart) to allow greater flexibility in application. Irwin (1987) suggested that this distance could be greater, but also noted that dispersal distances of juvenile pileated woodpeckers are poorly known. He offered no concrete alternative to the five-mile distance. Bull (1987) noted that the distance moved by eight juveniles from the nest where they were raised to the territory that they later occupied ranged from .4 to 5.4 miles and averaged 2.1 miles.

Size of Habitat Areas

The size of areas used by pairs of pileated woodpeckers during the nesting season has been observed to range from 320 acres in eastern Oregon to 1357 acres in western Oregon (Irwin, 1987). The management requirement established for pileated woodpeckers both east and west of the Cascades called for 300 acres of old growth or mature timber, containing at least 45 snags greater than 20 inches, plus 300 acres of feeding area. The requirement for 300 acres containing at least 45 large snags was taken from Thomas (1979). The additional requirement for 300 acres of small snags for foraging areas was established because of the evidence from the literature that pairs of pileated woodpeckers used areas larger than 300 acres. Acreage figures from Bull

Table F-6 Pileated Woodpecker Habitat Requirements

Principal Habitats Used	Dispersal Distance Between Habitats	Size of Area to Which Wildlife Prescriptions Apply	Habitat Requirements to be Used in Analyses
Zone II (West Cascades)[1]		All Zones	600 acres/pair within a 1,000 acre unit.
A. Reproducing			
Seral Stages V and VI of Kuchler types K2, K5, K6, K29, and riparian.	One habitat area for every 12,000 to 13,000 acres.		Maintain 300 acres of conifers in seral stages VI and/or V, per pair for reproducing. Maintain a minimum average of two hard snags per acre greater than or equal to 12 inches dbh within the 300 acre reproductive area. Forty-five of these 600 snags should be greater than or equal to 30 inches dbh. When possible, maintain reproductive area in 300 contiguous acres. If not possible, habitat may be arranged in blocks no less than 50 acres and no more than 1/4 mile apart.
B. Feeding			
All seral stages of Kuchler types listed for reproducing habitat, provided snags are present.			Maintain a minimum average of two hard snags per acre greater than or equal to 10 inches dbh on an additional 30 acres for feeding.

[1]*Mt. Hood National Forest is in Zone II, Westside Cascades. Principal habitats used vary by zone in the Region.*

Table F-7 Pine Marten Habitat Requirements

Principal Habitats Used	Dispersal Distance Between Habitats	Size of Area to Which Wildlife Prescriptions Apply	Habitat Requirements to be Used in Analyses
Zone II (West Cascades)[1]	One habitat area for every 4,000 to 5,000 acres.	160 acres per habitat area.	
A. Reproducing			
Seral stages V and VI of Kuchler types K2, K5, K6, K29.		(This figure represents the territory of one female and part of the territory for a male.)	Maintain 160 contiguous acres of conifer in seral stages V or VI with a crown closure 59 percent or greater.
B. Feeding			Within the 160 acre unit:
Seral stages III-IV of Kuchler types listed for reproducing habitat.			Twenty-four of the 320 snags should be greater than or equal to 20 inches dbh. Maintain a minimum average of six down logs per acre at least 12 inches dbh and 20 feet long.

[1] *Mt. Hood National Forest is in Zone II, Westside Cascades. Principal habitats used vary by zone in the Region.*

(1975), and Bull and Meslow (1977) were used. As more data specific to westside and eastside habitats (eastside may be further subdivided) become available, the size of the nesting area may be adjusted (Bull and Meslow, 1977; Bull, 1975; Mannan, 1982; Mellen, 1987). Mellen (1987) has already suggested an increase in habitat area in westside habitats based on results from radiotelemetry of pileated woodpeckers in the Oregon Coast Range. See Table F-6 for summary of habitat specifications.

Pine Marten Specifications

Principal Habitats Used

The pine marten uses seral stages III-VI--closed sapling-pole, large mature, and old growth (Thomas, 1979; Guenther and Kucera, 1978; Phillips and others, 1981). The Kuchler types used are from Guenther and Kucera (1978). The principal habitat for pine marten is seral stages V and VI (mature and old growth).

Dispersal Distance Between Habitats

Burke (1982) recommends that the maximum dispersal distance between habitat areas for pine marten should be two miles. In 1984 the Regional Forester changed the dispersal distance from two miles to three miles. This change was made because it was felt where more than one adjacent habitat is available for dispersal, the dispersal distance can be extended to three miles for pine marten. This change has been reviewed by a number of biologists within and outside the Forest Service and most agree that it would appear not to create a population viability problem for represented species. In June of 1986, the dispersal distance specification for pine marten habitat was changed to one habitat for every 4,000 to 5,000 acres (about three miles apart) to allow greater flexibility in application.

Juvenile marten dispersal up to 25 miles has been observed (Hawley and Newby, 1957 and Jonkel, 1959), and average juvenile dispersal distances greater than 6 miles were observed in these studies and in Burnett (1981). Based on this information, Irwin (1987) concluded that "the dispersal distance used in the MMR standards might be increased without reducing probabilities for interactions among adults or dispersing young". However, he did not provide a specific alternative, and concluded that there was little empirical insight into the probability of maintaining a viable marten population using the MR guidelines. As Burke (1982) noted, the distance covered by dispersing individuals is not an absolute guide to appropriate spacing between habitat areas. The probability of dispersing individuals locating habitat areas and other individuals decreases rapidly as habitat areas are spaced further apart. Burke suggested that the observed range of population densities might be a better guide to spacing of habitat areas. He noted that the three mile spacing would result in a marten density 1/9 to 1/27 of normal densities reported in the literature.

Size of Habitat Areas

In the professional judgment of the biologists listed in Phillips and Roberts (1985), a breeding female pine marten can be supported on 160 acres of quality habitat. Research is variable as to the size of area needed, but the female pine marten home range is estimated to be 160 acres (Campbell, 1979). The biologists listed in Phillips and Roberts (1985) judged that this area should be contiguous to ensure that there would be enough habitat within the home range of the female. They also judged that crown closure should equal or exceed fifty percent. Research papers indicate that areas with a low percent crown closure receive little or no use by pine marten. Therefore, to ensure an adequate crown closure, a minimum requirement of 50 percent closure was selected.

Research shows that pine marten require dead and down material for foraging, cover, and denning. Six down logs/acre (Burke, 1982) was selected as the minimum down material requirement. The number and size of snags required was selected to ensure that the amount of down material was achieved. The specifications for pine marten habitat are summarized in Table F-7.

Irwin (1987) noted that the MR guidelines contained an implied hypothesis that 160-acre areas would meet reproductive and winter range needs, and that marten would use broader areas containing a mix of less suitable habitat types at other times. He concluded that monitoring and research could provide appropriate tests of this hypothesis.

Alternative Ways of Meeting the Management Requirement for Pileated Woodpecker and Pine Marten

On the Mt. Hood National Forest, mature conifer habitat is defined as a stand of predominantly conifers which are over 100 years old.

Habitat areas for pine marten and pileated woodpeckers were mapped using Regional spacing, size, and habitat suitability criteria. Pine marten sites are to be located every 4,000 to 5,000 acres and pileated woodpecker sites every 12,000 to 13,000 acres.

Whenever possible, sites were placed within Wilderness, Wild Rivers, RNA's, other areas unsuitable for timber

production, and in areas of reduced harvest levels, wherever these met habitat quality and distribution requirements.

Table F-8 summarizes the number of mature conifer sites for pileated woodpecker and pine marten located by unsuitable and tentatively suitable timber land. These figures do not account for overlap of marten and woodpecker sites and does not account for overlaps of sites with both suitable and unsuitable lands.

Table F-8 Mature Conifer Habitat Sites

Species	Unsuitable Timber Land (# of sites)	Suitable Timber Land (# of sites)
Pine Marten	54	177
Pileated Woodpecker	21	75

The Forest considered two options for providing mature conifer habitat. One was to dedicate the required number of acres of suitable habitat in each site. These areas would not be managed for timber production and would be expected to remain in suitable habitat condition for several decades. The second option was to manage timber stands on a larger area in order to harvest timber and produce replacement stands over time. The Mt. Hood National Forest chose to provide mature conifer habitat by dedicating the required amount of habitat.

Alternative 1: Dedicated Sites

Under a dedicated mature conifer strategy, the required amount of mature conifer is withdrawn from timber production. Dedication of mature conifer sites has the advantage that the location of the stand does not change over time, making implementation less complicated. Dedication also assures that desired structural characteristics will be available for wildlife. There may be some risk of loss of individual stands through catastrophe.

Alternative 2: Managed Sites

This option involves the projection of long rotations on enough acres to maintain the necessary habitat through time, with the core areas being rotated. This means that for every acre of suitable habitat, acres would be managed as replacement stands when the original acre is harvested. Production of mature conifer habitat is expected to take around 100 years; rotations of 280 are used to model a managed regime. The 280 year rotation age is based on the need for a contiguous core area and harvest limitations dealing with the size and dispersion of created openings.

Management of mature conifer sites assumes that existing stands can be harvested as other stands grow into a mature conifer condition to replace them. If replacement stands fail to develop desired structural characteristics (i.e. large diameter snags and down material) as predicted, mature conifer habitat would either be lost for a period of time or further delay in harvesting the existing mature conifer stands would occur.

Tradeoff Analysis

An analysis of the two alternative approaches to providing conifer habitat was performed using FORPLAN. The dedicated approach allocated a 160 acre core area to minimum level (no harvest) for each pine marten site and a 300 acre core area to minimum level for each pileated woodpecker site. The managed strategy doubled these acreages to 320 and 600 acres to allow for an alternating core for each site. These sites were modeled with a 280 year rotation. This rotation length allowed 40 years to harvest the secondary core, 100 years for that secondary core to achieve a mature conifer condition, another 40 years to harvest the primary core, 100 years for the primary core to achieve a mature conifer condition, and then the cycle repeats. A strategy of alternating core areas was modeled instead of a simple acre by acre replacement strategy because of the need for a core composed of contiguous acres and the difficulties that implementation of any other strategy would present. The 40 years required to harvest a core area is the direct result of the dispersion of created openings management requirement.

Using Benchmark 3 as a base, two FORPLAN runs were formulated that only added the constraints necessary to provide the required mature conifer habitat. The impacts of these approaches were compared to Benchmark 3 results and are displayed in Table F-9. When compared to Benchmark 3, which does not include any management requirements, both approaches reduce first decade ASQ by 6 percent and PNV by 8 percent. The difference between the two approaches is less than 1 percent and was not considered significant. Table F-3 allows a comparison of the mature conifer habitat MR to the other management requirements that were evaluated.

Table F-9 Analysis Results of Alternative Means for Meeting the Mature Conifer Habitat Management Requirements

	First Decade ASQ (MMBF/year)	Changes in ASQ	LTSYC (MMCF/year)	Changes in LTSYC	PNV (MM$)	Changes in PNV
PNV Benchmark with no protection measures	421	-	69	-	1,352	-
PNV Benchmark using alternative 1 (dedicated sites) to provide mature conifer habitat	395	6%	65	6%	1,248	8%
PNV Benchmark using alternative 2 (managed sites) to provide mature conifer habitat	395	6%	64	6%	1,246	8%

Consequences of the Different Ways of Meeting the Management Requirements

Populations of pileated woodpeckers and pine marten would not be expected to differ significantly under either alternative. Both would maintain the same amount and distribution of habitat. Also, the differences in the PNV and timber outputs are insignificant.

Rationale for the Selected Method

The Mt. Hood National Forest chose to provide mature conifer habitat by dedicating sites where needed on tentatively suitable timber land. This alternative is easier to model and implement. It does not require complex modeling constraints or an equally complex implementation strategy to achieve a desired harvest scheduling pattern. Modeling these areas as dedicated for this planning period does not preclude future planners from designating replacement areas as substitution opportunities can be identified (i.e., some existing pole stands could be substituted for originally designated areas by the 5th decade). Whether areas are modeled as designated or managed, there would be little difference in implementation for the first planning period.

Implications for Forest Plan Alternatives

Plan alternatives were designed to address public issues. As a result most alternatives, including the preferred, incorporate objectives for retention of mature and old growth timber for a variety of reasons, such as wildlife, scenery, and recreation. Pine marten and pileated woodpecker areas overlap with areas selected for other purposes (such as unroaded recreation areas and special interest areas) wherever these sites meet habitat suitability and distribution requirements. Methods resulting in the PNV and ASQ changes shown in Table F-3 would benefit other resource uses as well.

Role of Monitoring and Research

The Forest Monitoring Plan (Forest Plan Chapter V) calls for monitoring populations and habitats of pileated woodpeckers and pine marten. At scheduled plan reviews, monitoring data will be considered in determining the suitability and effectiveness of the selected method for meeting the management requirement for viable populations. This will be an important test of the appropriateness of the selected modeling assumptions.

Information needs for both pine marten and pileated woodpecker include:

- Are sufficient numbers of habitat management areas provided to meet the distributional pattern of one area every five miles for pileated woodpeckers and one every two miles for pine marten?
- Does the habitat within identified habitat areas meet Forest definition as suitable mature/old growth forest?
- Have management plans for maintenance/enhancement of habitat areas been developed and implemented?
- Are habitat areas occupied by pileated woodpeckers and martens?

- Are habitat areas providing for viable populations?
- Do all management activities planned within woodpecker and marten areas meet standards and guidelines for the allocation?

Specifications For Meeting The Habitat Requirements For Northern Spotted Owl

Specific Regional direction for the northern spotted owl is found in the Final Supplement to the Environmental Impact Statement (FSEIS) for an Amendment to the Pacific Northwest Regional Guide released in August, 1988. In response to an appeal of the R-6 Regional Guide, the Supplement was prepared to address planning direction for spotted owl habitat management. Standards and guidelines adopted as a result of the Supplement will be used by National Forests in the Region to meet the management requirement to maintain viable populations of spotted owls.

The Final SEIS was prepared after a series of public meetings and study of the nearly 42,000 comments received on the Draft Supplement issued in the summer of 1986. A summary of the analysis of public comments, substantive comments, and copies of letters received from government agencies and elected officials can be found in Appendix E of the FSEIS.

The Forest Service Preferred Alternative (Q) directs that the amount of suitable habitat at each designated SOHA will vary by physiographic province. Specific criteria were followed in locating designated SOHA's on the Mt. Hood (see below). Current distribution of owl habitat on lands unsuitable for timber production was evaluated for adequacy of distribution. SOHA's were designated on lands suitable for timber production only when necessary to meet distribution and habitat quality standards. Standards and Guidelines for the Forest Service preferred alternative are briefly summarized in the following discussion. Chapter II of the Final Supplement should be reviewed for a detailed description of the direction. These Regional Standards and Guidelines provide specifications or standards for achievement of management requirements for northern spotted owls:

Amount of Suitable Habitat in Designated Habitat Areas

Designated habitat areas shall contain the following amount of suitable habitat in the Cascade Mountain physiographic province: 1500 acres within 1.5 miles of the nest site... Habitat shall occur as one contiguous stand if possible or, as a 300-acre stand containing the known or suspected nest site with the remaining habitat as contiguous as possible. Each stand shall be larger than 60 acres.

Spacing of Designated Habitat Areas

Designate habitat areas where: greater than six miles separates areas which occur in reserved lands or in lands unsuited for timber production, and which are capable of supporting less than three breeding pairs of spotted owls; or where greater than 12 miles separates such areas capable of supporting three or more pairs.

Threatened and Endangered Species

No spotted owl habitat management activities shall adversely effect Federally listed threatened or endangered species or their habitat.

Identification of Suitable Habitat

Suitable habitat shall be identified in Forest Plans according to the general definition in the spotted owl Final Supplement and with concurrence by the Regional Forester.

Management of Habitat

Spotted owl habitat can be provided through prescriptions using even-aged or uneven-aged silvicultural systems, or no scheduled harvest. Prescriptions to be used and where they will apply shall be specified in the Forest Plans.

Location of Designated Habitat Areas

Designate habitat areas only on lands suitable for timber production as needed to meet spacing standards.

Priority for Locating Designated Areas

Priority for locating designated areas follows status of occupancy by spotted owls. The highest priority is given to locations with verified occupancy by spotted owl pairs; next highest to locations with confirmed sightings of owls; lowest priority to locations where the presence or absence of owls is unknown.

The Final Supplemental Environmental Impact Statement (FSEIS) to the Regional Guide (for spotted owl habitat management guidelines) does not include the number of designated habitat areas as part of any alterna-

tive. The number of habitat areas are not specified in the Regional Guide, but will be a consequence of applying standards and guidelines in Forest Plans.

Alternative Ways of Meeting the Management Requirements for Northern Spotted Owl

The Forest considered two ways or means for providing spotted owl habitat. One is to dedicate the required number of acres of suitable habitat in each site. These areas would not be managed for timber production and would be expected to remain in suitable spotted owl habitat over time. The second way is to manage timber stands through long rotations in order to produce replacement stands over time. The Mt. Hood National Forest chose to provide spotted owl habitat by dedicating the required amount of habitat.

Alternative 1: Dedicated Sites

Under a dedicated habitat strategy, each acre of spotted owl habitat is withdrawn from timber production. Dedication of existing stands assures that desired structural characteristics will be available, but may risk loss of individual stands through catastrophe or decay. Recent literature on old-growth suggests this risk is much less than once thought.

Alternative 2: Managed Sites

Management of sites assumes that existing old growth stands can be harvested as they are replaced by other stands that grow into an old-growth condition. Delay in harvesting the existing old-growth stands would occur if replacement stands fail to develop desired structural characteristics on schedule. Management of old growth on a harvest basis and replacing it removes structural characteristics important to old-growth and may hasten the decline of the residual stand (Franklin 1981).

Tradeoff Analysis

An analysis of the two alternative approaches to providing spotted owl habitat was performed using FORPLAN. The dedicated approach allocated a 1500 acre core area to minimum level (no harvest) for each spotted owl site. The managed strategy doubled this to 3000 acres to allow for an alternating core for each site. These sites were modeled with a 420 year rotation. This rotation length allowed 40 years to harvest the secondary core, 170 years for that secondary core to achieve the required condition, and then the cycle repeats. A strategy of alternating core areas was modeled instead of a simple acre by acre replacement strategy because of the need for a core composed of contiguous acres and the difficulties that implementation of any other strategy would present. The 40 years required to harvest a core area is the direct result of the dispersion of created openings management requirement.

Using Benchmark 3 as a base, two FORPLAN runs were formulated that only added the constraints necessary to provide the required spotted owl habitat. The impacts of these approaches were compared to Benchmark 3 results and are displayed in Table F-10. The impact on PNV and timber outputs of the managed approach is 3 to 4 percent greater than the dedicated approach. When compared to Benchmark 3, which does not include any management requirements, the dedicated approach reduces first decade ASQ by 10 percent, LTSYC by 9 percent, and PNV by 11 percent. Table F-3 allows a comparison of the spotted owl habitat MR to the other management requirements that were evaluated.

Consequences of the Different Ways of Meeting the Management Requirements

Populations of spotted owls would not be expected to differ significantly under any of the options available to meet the management requirement. There are, however, differences in the impacts on PNV and timber outputs.

Rationale for the Selected Method

The Mt. Hood National Forest chose to provide spotted owl habitat by dedicating habitat sites. This alternative maintains necessary habitat, and has the least effect on timber outputs; it is an economically efficient way of meeting the management requirement with the least impact on PNV.

The dedicated habitat approach has the advantage that the location of the habitat site does not change over time, making implementation less complicated than relocating the habitat site as the stands are harvested and replaced.

Implications for Forest Plan Alternatives

Plan alternatives were designed to address public issues. As a result most alternatives, including the preferred, incorporate objectives for retention of old-growth and mature timber for a variety of reasons, such as wildlife, visual, and recreation. To the extent possible, spotted owl habitat areas overlap with areas selected for other purposes (such as Wilderness, unroaded recreation areas, special interest areas and other lands determined as not appropriate or unsuited for timber production), wherever these meet habitat suitability and distribution requirements. The analysis results of selected means of spotted owl protection displayed in this appendix are gross PNV and ASQ effects caused by the selected im-

Table F-10 Analysis Results of Alternative Means for Meeting the Spotted Owl Management Requirements

	First Decade ASQ (MMBF/year)	Changes in ASQ	LTSYC (MMCF/year)	Changes in LTSYC	PNV (MM$)	Changes in PNV
PNV Benchmark with no protection measures	421	-	69	-	1,352	-
PNV Benchmark using alternative 1 (dedicated sites) to provide spotted owl habitat	381	10%	62	9%	1,202	11%
PNV Benchmark using alternative 2 (managed sites) to provide spotted owl habitat	369	12%	60	12%	1,156	14%

plementation methods. The costs do not take into account any overlap that may occur among implementation methods where lands selected for spotted owl habitat may also meet other wildlife, scenery or recreation objectives on lands suitable for timber harvest.

Role of Monitoring and Research

The Forest Monitoring Plan (Forest Plan Chapter V) calls for monitoring populations and habitats of spotted owls.

The Final Supplemental Environmental Impact Statement to the Regional Guide (Appendix D) identifies specific monitoring and research needs and describes how the information will be obtained. Intensive inventory, monitoring, and research being conducted by the Spotted Owl Research, Development, and Application Program will provide new information. This should allow an opportunity to re-evaluate and possibly adjust management direction within five years.

Appendix G

Coordination

Appendix G
Coordination

Appendix G - Coordination

Introduction

Coordination with other public land management or land use planning agencies is required by 36 CFR 219.7. As a part of the coordination requirement, the Forest has reviewed the plans of these other agencies. Following are synopses of the agencies plans as they may affect the Mt. Hood National Forest.

Synopses of Plans

Multnomah County Comprehensive Framework Plan

Adopted: September 6, 1977

Last Updated: February, 1990

The county plan calls for intergovernmental cooperation with all agencies. The plan specifically stated, as a policy, that it would attempt to maintain the integrity of this plan if it is affected by the actions of an adjacent jurisdiction which may have off-site impacts. The plan calls for encouragement of economic development, including those industries which process natural resources. At the same time, it calls for management of growth and minimizing the conflicts between urban and natural resource uses. The plan classified four categories of natural resource lands, of which, Commercial Forest and Multiple Use Forest would most concern the Mt. Hood National Forest.

Commercial Forest land is that land which has the following characteristics:

- Site I, II and III soils (for Douglas fir, as classified by the U.S. Soil Conservation Service);
- Suitability for commercial forest use;
- Ownership predominately by private corporate timber companies or public agencies and in commercial forest use;
- Not impaired by urban uses;
- Cohesive forest areas with large parcels.

Other areas which are necessary for watershed or habitat protection, subject to erosion or land failure, potential recreational areas of scenic significance may also be classified as Commercial Forest lands. The policy of the county is to restrict incompatible use on these lands and to allow forest management and compatible uses. Under the strategy for Commercial Forest Lands the zoning code limits residential use to that which is resource related. Conditional residential uses may also be permitted. The plan calls for setting standards to conserve natural resources and for protection from hazards.

Multiple Use Forest areas are similar to Commercial Forest Lands except for the following differences:

- The land is suitable for forest use and small wood lot management, but it is not in predominately commercial ownership.
- The areas is provided with rural services sufficient to support the allowed uses, but is not impacted by urban level services.

Size of parcels is not mentioned as a characteristic. The policy is to allow forestry uses, as well as non-forestry uses such as agriculture or cottage industries, provided the uses are compatible with adjacent forest lands. Under Multiple Use Forest Areas the zoning code permits residential uses under conditions similar to those of Commercial Forest Lands. In addition, uses such as processing of agricultural products, commercial recrea-

tional uses and community facilities are permitted. Conditional use of planned rural development is also allowed.

Multnomah County's plan calls for a policy of limiting development or requiring mitigation under the following circumstances:

- Where slopes exceed 20%;
- Where there is a severe potential for erosion;
- Within hundred year flood plains;
- Where seasonal water tables are high (defined as within 0-24 inches of the surface for three or more weeks a year;
- Where the fragipan is less than 30 inches from the surface;
- Where the land is subject to slumping, earth slides or movement.

Their plan designates areas of Significant Environmental Concern, including three specific areas which directly or indirectly affect the Forest. Areas of significant Environmental Concern are those with characteristics such as special wildlife habitat; scenic, recreational or historical values; or hazardous conditions. The Columbia Gorge, the Sandy Scenic River and parts of the Mt. Hood National Forest have been designated as areas of Significant Environmental Concern. The policy of the plan is to protect such areas by:

- Maintenance of an inventory of data which delineates their boundaries and pertains to their values;
- Requirement of a special review for certain types of development to ensure minimum impact on their values;
- Primarily emphasizing the protection of each area's value factors.

There are no identified conflicts with the Multnomah County Comprehensive Framework Plan and the Forest Plan.

Clackamas County Comprehensive Plan

Comprehensive Plan Update: 1989

Mount Hood Community Plan: August 5, 1982

With the exception of the Mt. Hood Community, most of that land in Clackamas County which is in the vicinity of the Mt. Hood National Forest has been designated as Forest. This designation is defined as existing and potential commercial forest lands suitable for such uses, as well as lands needed for watershed and habitat protection and those in hazardous areas. According to the policies of the plan, the criteria for the Forest Land Use Designation are:

- Land with sites identified as I, II, III, IV and V as determined by the State and the Forest Service;
- Areas with parcels 20 or more acres in size;
- Land that is generally in forest use.

Land which is environmentally sensitive should be designated as Forest and land which serves as a buffer between areas of differing intensities of use may be designated as Forest. Allowable uses are those related to Forest management. Land uses which would conflict with forest related uses will not be allowed, although housing will be limited, not prohibited. The grouping of dwellings is encouraged.

The Clackamas County Comprehensive Plan states that the county shall apply zoning districts to the Mt. Hood National Forest which are consistent with the Forest's land allocation and management plans. The plan also has declared several Forest roads to be scenic. The plan states, as a policy, that the county supports visual management techniques of Federal lands within the County. There is no conflict with the County's designation of scenic roads and the Forest's Visual Resource Inventory.

The main area of concern on land use issues between Clackamas County and the Forest is the series of settlements and villages, located on the west flank of the mountain, known as the Mt. Hood Community. Private land extends along State Hwy 26, well up the side of the mountain. Several areas of private land are completely surrounded by Forest lands. Clackamas County has developed an additional land use plan with special emphasis on the Mt. Hood Community.

The plan has applied the following Comprehensive Plan designations for the Mt. Hood Community:

- Forest
- Agricultural
- Rural
- Rural Commercial
- Urban Low Density Residential
- Community Commercial
- Open Space

The Mountain Recreation Designation may also be applied. The three village districts are treated somewhat

separately. The main differences are in the intensities allowed in the Mountain Recreation Zone as applied to the three villages. Mountain Recreation may not be applied outside of these three villages.

The Mountain Recreation Designation provides for overnight recreational housing as well as a higher density than that permitted in Low Density Residential. Allowable uses are multi-family housing, resorts and motels. Incidental commercial use would be allowed on a limited basis. The criteria for the designation is that the area:

- Is within a village district,
- Has available public water and sewer,
- Has a character and pattern of previous development that would not be adversely affected by the designation.

The density of development is termed *intensity* and is based on floor area. The plan designates the Village District of Government Camp as high density in character, the Village District of Rhododendron as low intensity in character and the Village District of Wemme-Welches as medium density in character. Further, in the Village District of Wemme-Welches, new development is encouraged to be located away from Hwy 26, and development of recreational-resort facilities to support the area's recreational amenities is also encouraged.

In addition to the Mountain Recreation Designation, housing is provided for the Recreation Residential and Low Density Residential zones. Recreational Residential is allowed in areas designated as rural and on parcels generally two acres or less, if the area is already significantly affected by development. There may not be natural hazards within this designation. Low Density Residential is allowed within the Mt. Hood Urban Area Designation and is confined to the Village Districts. The criteria are the same as in the county comprehensive plan except that the maximum density is four units per acre. Density may be increased by density bonuses which can be awarded if the development meets certain criteria such as providing for low income housing or public recreation.

Community uses are allowed in the Community Commercial Designation within the Urban Area. Only the Rural Tourist Zone will apply. The Rural Commercial Designation applies to the areas outside the urban areas. The purpose of this designation is to allow already existing uses to remain without being a nonconforming use.

The Resource Protection Open Space Designation is applied to 100 year flood-plains and slopes of 25% or more. Development is permitted only under strict conditions. Fragile and hazardous areas are a component of the Open Space Designation and are to be established within the Mt. Hood urban area. This designation applies to 100 year flood plains, identified land movement areas, slopes over 25% and wetlands. Except for single family residences on lots of record, development is not permitted on fragile and hazardous areas. However, in stated cases, bonus density points may be awarded to permit more dense development of other portions of a given parcel that may be partially in a fragile or hazardous area.

Except possibly for the Mt. Hood Community, there are no conflicts between the Clackamas County Comprehensive Plan and the Forest's ability to manage its lands. The urbanization of the Mt. Hood Community is cause for some concern. This concern was addressed in the Responses to the ICOs in Chapter 5 of the Analysis of the Management Situation. While the county plan provides a framework for development and some control on where the most intense development may occur, it does allow for an increase in the population and urbanization in the Mt. Hood Community. As stated in the Responses to the ICOs, pressures caused by the increase in growth can affect the forest.

Hood River County Land Use Plan

Comprehensive Land Use Plan Update: December 1984

Most of the lands in Hood River County adjacent to the Forest, and nearly all of them on the Forest, have been designated as Primary Forest and zoned F2. Some of the area around Parkdale near the Forest has been designated as Forest and Farm, zoned Exclusive Farm Use. North of Parkdale is a small area designated as Rural Residential.

Areas on the Forest and adjacent to it which have special designation are the Parkdale Lava Beds and the Columbia Gorge. The Lava Beds are designated as a Natural Area. The face of the Columbia Gorge is zoned Scenic Protection, while the talus slopes and streams have been designated as Environmental Protection. An area off the Forest which includes land three miles to the east and west of Hood River is zoned the Columbia Gorge Combining Zone.

The Primary Forest Designation is made in those areas where the site classification for the majority of the lands is 3 through 7, with most of the lands being site 3, and the average parcel size is 282 acres. The lands may be at higher elevations and may be in more rugged areas. Public access roads are generally limited and housing development almost non-existant. The goal is to en-

courage the management of forest commercial lands and to conserve them. Most of the permitted uses are those associated with timber management and harvest, although other resource management uses such as gravel extraction and farm uses are also permitted. Certain other uses such as recreational sites and the processing of wood products may be permitted as conditional uses. Minimum lot size is 40 acres.

The Forest designation is for areas which are buffers between Farm and Rural Residential. The average parcel size is between 29 and 49 acres and they are usually not owned by timber companies, serving instead as wood lots The goal is to minimize conflicts with urbanization and the uses are similar to those in Primary Forest. Minimum lot size is 40 acres. The Farm designation is for areas in which the principle use is farming.

The goal is to protect farmland. Minimum lot size is 20 acres. The Rural Residential designation is for those areas in which the primary use is residential and which are already committed to non-resource use. These lands are outside the Urban Growth Areas. Rural services are present and rural housing does not conflict with agricultural and forestry. Minimum lot sizes vary from 1/2 acre to 5 acres.

The goal of the Natural Area designation is to conserve, preserve and protect natural areas. The Natural Areas of concern to the Forest are the Parkdale Lava Beds and three areas (Elk Meadows, Tanner Butte Mountain Goat Area and Chinidere) now in Wilderness. A policy statement supports the Forest Service and the Nature Conservancy in their efforts to maintain and preserve the Parkdale Lava Beds. The plan also supports the coordination of management plans with the affected property owners. The plan supports the Forest and its plan management designations for the three previously mentioned areas to be in Wilderness.

The purpose of the Scenic Protection Zone is to protect and enhance the significant scenic protection. Much of this zone is in public ownership. Permitted uses are farming, maintenance and rehabilitation of recreational facilities and roads, selective cutting timber harvest and one single family dwelling per lot. Minimum lot size is 40 acres. Conditional uses include new recreational facilities and public utilities. All development must meet standards designed to preserve the scenic quality of the Gorge. There are special standards for clearcutting in the Gorge.

The Environmental Protection Plan designation is intended to protect life, prevent economic hardship and to protect watersheds and fish and wildlife habitat. It is implemented by the Environmental Protection Zone, the Floodplain Zone and the Geological Hazard Zone. Permitted uses are those which are low intensity in character and permanent buildings are limited and must meet specific conditions.

Other plan statements of interest to the Forest include the following:

- A list of scenic roads, most of which agree with the Forest's scenic inventory. The Old State Highway is not on the scenic inventory.
- A statement supporting the Forest's management plans for the Cloud Cap Inn - Tilly Jane Recreation areas.
- A statement supporting the protection of the Mt. Hood Wilderness Area.
- A statement supporting the placement of the Barlow Road on the list of Historic Places.
- A statement saying the Mt. Hood *"should cooperate with the County in the development of the Oregon Trail System."*

In conclusion, there are no conflicts of any consequence between the Hood River County Comprehensive Land Use Plan and the management of the Forest's lands.

Wasco County Land Use Plan

Comprehensive Land Use Plan Adopted: February 1982

Latest Amendments: April 1984

By far the greatest amount of land in Wasco County which is on the Forest and adjacent to it is designated as Forestry and zoned either F1 or F2. A few small areas near the Forest are zoned Agricultural-Residential and Forest-Farm. One parcel of the former is an in-holding on the Forest. A small area of land zoned Rural-Residential is near the Forest.

That land which is designated as Forestry is all publicly and privately owned commercial forest land which has a productivity greater than 20 cubic feet per year. The purpose of the designation is to provide for all commercial and multiple use compatible with sustained yield. The permitted uses on land zoned F1 are those which are related to the management and harvest of forest resources and the processing of wood products. Farming and conservation uses are also permitted uses. Conditional uses include the extraction of gravel, water treatment and utilities. Subdivisions are prohibited. The minimum lot size is 80 acres. Uses permitted on land zoned F2 are similar to those in F1. In addition, certain signs and the maintenance and rehabilitation of recreational sites is

also permitted. More conditional uses are allowed in F2 than in F1. They include such uses as recreational facilities, ski resorts and single family residences. However, subdivisions are prohibited. The minimum lot size is 80 acres.

The purpose of the Agriculture-Residential Zone is to provide for outdoor recreational areas and to allow controlled growth to continue in already existing rural communities. Agriculture, highly developed recreational facilities, recreational vehicle parks and single family dwellings are among the permitted uses. Subdivisions are also permitted. The purpose of the Forest-Farm Zone is to allow for small scale or hobby farms by permitting dwellings in relation to farm use, while at the same time preserving open space. Permitted uses are agriculture and single family residences. The minimum lot size is 10 acres. The purpose of the Rural-Residential Zone is to provide for low density residential and agricultural uses which will not conflict with commercial farming operations. Permitted uses include subdivisions and planned unit developments.

The comprehensive plan listed several areas as outstanding scenic areas. Included were the White River within the River Canyon. This area is on the Forest. Portions of the White River may be considered for recommendation as a wild and scenic river. Historical sites were also listed including the Barlow Road, Bear Spring Camp Shelter and the Old White River Station Camp. Although the plan stated that the Bear Spring Camp Shelter was owned by the Forest Service, this is no longer true. That site is now on the Warm Springs Reservation. The Old White River Station Camp is on the Forest and is one of the associated sites on the Barlow Road. As such, that site is, along with the Barlow Road itself, on the National Register of Historic Places and is protected. The site no longer has any structures on it, but it still has archeological value.

The Dalles Municipal Watershed is of particular concern to the Forest, the City of The Dalles and Wasco County. There is a comprehensive plan for the watershed. Protection of the soil and water resources is a primary objective. Those uses which do not conflict with the primary objectives may be permitted.

There is no conflict with Wasco County's designation of Forest on most of the lands in the vicinity of the Forest and the ability of the Forest to manage its land. However, those areas which have been placed in zones that permit subdivisions pose a problem. Suburban development has occurred near the boundaries of the Forest. This situation is discussed further in the Responses to the ICOs in Chapter 5 of the Analysis of the Management Situation.

The Comprehensive Plan of the Confederated Tribes of the Warm Springs Reservation

Warm Springs Reservation Comprehensive Plan: 1983

Most of the lands on the reservation adjacent to the Forest are designated as Forest Land. Development on these lands is limited to roads, transmission lines, old mill sites, ranger stations, lookouts and recreation sites. Housing on these lands does not exist. Timber management and harvest is the primary use. Compatible secondary uses are maintaining fish and wildlife habitat, gathering of traditional foods and grazing livestock.

Adjacent to the Mt. Hood and south of the Forest designation are lands which are designated Recreation Lands. Tribal members are expected to be the main users of these lands. The primary uses are recreational pursuits which preserve the natural and scenic features of the area. Compatible secondary uses are maintaining fish and wildlife habitat and gathering traditional foods. Incompatible uses include most types of development and intensive resource use. This area is adjacent to the Olallie Area on the Mt. Hood and the uses for this designation are compatible with the uses of the Olallie.

Further south is an area which has been designated as Wilderness. The presence of the Wilderness is important to many tribal members. This designation is adjacent to the Mt. Jefferson Wilderness on the Mt. Hood and the Deschutes. There is no conflict between the Wilderness Designation and the uses on the adjacent National Forests. To the east of the Forest boundary are lands which are designated as Rangelands. The main use is the grazing of livestock. Roads, powerlines, fences and scattered rural housing are the developments present. Again, there is no conflict with the management of the Mt. Hood.

The Forest has a policy of coordinating with the Confederated Tribes of the Warm Springs. More of this coordination is discussed in the Analysis of the Management Situation in the Responses to the ICOs in Chapter V.

Plans of the State and Other Federal Agencies

The BLM was contacted in July of 1990 and that agency indicated that there were no problems of incompatibility in the management of our adjacent lands. The Oregon Department of Fish and Wildlife and the Forest continuously coordinate on the management of fish and wildlife habitat. This coordination is discussed in Chapter II of the Analysis of the Management Situation and in the Responses to the ICOs in Chapter V. The Bonneville Power Administration was contacted in July of 1990. That agency has no plan, as such, for their transmission lines. It is not expected that they will require any new rights-of-way. This issue is also discussed in the Responses to the ICOs.

Appendix H

Best Management Practices

Appendix H
Best Management Practices

Appendix H - Best Management Practices

Introduction

Definitions

Nonpoint Sources refer to diffuse or unconfined sources of pollution where wastes can either enter into, or be conveyed by the movement of water to, public waters (Oregon Water Quality Standards, OAR 340-41-007(17)). Silvicultural sources, such as erosion from a harvest unit or surface erosion from a road are considered nonpoint sources.

Best Management Practices (BMPs) are defined as *"methods, measures or practices selected by an agency to meet its nonpoint source control needs. BMPs include, but are not limited to, structural and nonstructural controls, operations, and maintenance procedures. BMPs can be applied before, during, and after pollution-producing activities to reduce or eliminate the introduction of pollutants into receiving waters"* (EPA Water Quality Standards Regulation, 40 CFR 130.2).

Usually BMPs are applied as a system of practices rather than a single practice. BMPs are selected on the basis of the site-specific conditions that reflect natural background conditions and political, social, economic, and technical feasibility (EPA 1985).

BMPs are basically a preventative rather than an enforcement system. BMPs are a whole management and planning system in relation to sound water quality goals, including both broad policy and site-specific prescriptions.

Summary

Best Management Practices are the primary mechanism to enable the achievement of water quality standards (EPA 1987). BMPs will be selected and tailored for site-specific conditions to arrive at the project level BMPs for the protection of water quality. The process for determining appropriate BMPs and for ensuring their implementation at both the Forest Plan and project level is described.

Following is a description of the methods and procedures that will be used to control or prevent nonpoint sources of pollution from resource management activities, and to ensure compliance with the:

Clean Water Act of 1972, as amended (1977 and 1987). Section 319 of the Clean Water Act Amendments of 1987 requires that the States determine those waters that will not meet the goals of the Act, to determine those nonpoint source activities that are contributing pollution, and to develop a process of determining BMPs to reduce such pollution to the maximum extent practicable. This Appendix is designed to fulfill the intent of the requirements of Section 319.

Oregon Administrative Rules (OAR 340-41-001-975), Department of Environmental Quality (DEQ). Oregon's Administrative Rules contain water requirements for the protection of identified beneficial uses of water:

Memorandum of Understanding. The Oregon Department of Environmental Quality and USDA, Forest Service (February 12, 1979, and December 7, 1982), 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 Best

Management Practices for Range and Grazing Activities on Federal lands, respectively).

The EPA has certified the Oregon Forest Practices Act as BMPs The State of Oregon compared Forest Service practices with these State practices and concluded that Forest Service practices meet or exceed State requirements. As State practices change, comparisons are made to ascertain that Forest Service practices meet or exceed these changes. Monitoring and evaluation will determine the need for changes in BMPs and/or State standards.

Forest Service management practices will meet, as a minimum, the substantive State BMP requirements, and other considerations required by the National Forest Management Act (NFMA), and other authorities, for the protection of the soil and water resource.

The general BMP's described herein are action initiating mechanisms which all for the development of detailed, site-specific BMP prescriptions to protect beneficial uses and meet water quality objectives. They are developed as part of the NEPA process, with interdisciplinary involvement by a team of individuals that represent several areas of professional knowledge, learning, and/or skill appropriate for the issues and concerns identified. BMP's also include such requirements as Forest Service Manual direction, contract provisions, environmental documents, and Forest Plan Standards and Guidelines. Inherent in prescribing project-level management requirements is recognition of specific water quality objectives which BMP's are designed to achieve.

BMP Implementation Process

In cooperation with the State, the primary strategy for the prevention and control of nonpoint sources is based on the implementation of BMP's determined necessary for the protection of the identified beneficial uses.

The objective is to identify the most practical means of attaining water quality objectives. Water quality objectives include water quality measures that adequately reflect the needs of identified beneficial uses.

The Forest Service Nonpoint Source Management System consists of:

- Selection and design BMP's based on site-specific conditions, technical, economic and institutional feasibility, and the water quality standards of those waters potentially impacted.
- Implementation and enforcement of BMP's.
- Monitoring to ensure that practices are correctly applied as designed.
- Monitoring to determine the effectiveness of practices in meeting design expectations and in attaining water quality standards.
- Evaluation of monitoring results and mitigation where necessary to minimize impacts from activities where BMP's do not perform as expected.

Adjustment of BMP design standards and application when it is found that beneficial uses are not being protected and water quality standards are not being achieved to the desired level. Evaluation of the appropriateness of water quality criteria to reasonably assure protection of beneficial uses. Consideration of adjustment of water quality standards.

BMP Selection and Design - Step 1

Scoping

Potential concerns and major issues are identified, e.g. water quality, as part of the NEPA process for environmental analysis. Public notices are dispersed inviting comment and participation in the process. Alternatives are developed to address the major issues and potential problems, and to accomplish project objectives.

Environmental Analysis

Each alternative is evaluated for its potential effect on different resources, including water. From this analysis, a preferred alternative is identified, along with the measures (BMP's) needed to reduce risk and increase the potential for success.

Documentation

When an Environmental Assessment (EA) or Environmental Impact Statement (EIS) is prepared to document the analysis, these documents include the management requirements and mitigation measures, including the site-specific BMP's. A Finding of No Significance (FONSI) and Decision Notice or, in the case of an EIS, a Record of Decision is issued which identifies the selected alternative, the rationale for the decision, and accompanying measures (BMP's).

On many projects, water quality is an important environmental component. The analysis and comparison of possible alternatives are disclosed in the required docu-

ments (EA or EIS); the description of the affected environment and evaluation of potential activity effects on water quality are included. BMP's are incorporated into the design of the alternatives to avoid or minimize potential adverse water quality problems. The selected alternative, as described in the decision, occasionally is accompanied by additional water quality mitigations (BMP's) to meet management goals and improve overall protection of the resources. Water quality standards are used as objectives towards which practices are designed to protect beneficial uses.

More specifically, appropriate BMP's are selected for each project by an interdisciplinary team. BMP selection and design are dictated by water quality objectives, soils, topography, geology and landform, channel morphology, vegetation, climate, economics, institutional constraints, etc. Environmental effects and water quality protection options are evaluated and a range of practices considered. A final set of practices are selected that not only protect beneficial uses, but meet other resource needs. These final selected practices constitute the BMP's.

The selected BMP's, an estimate of their effectiveness, and a plan for monitoring them is included in the project EA or EIS. The site-specific BMP prescriptions are normally included in project implementation plans (analysis files), but may also be included in the body or appendix of a project environmental document.

BMP Implementation and Enforcement - Steps 2 and 3

The site-specific BMP prescriptions are taken from plan-to-ground by a combination of project layout and resource specialists (hydrologists, fisheries biologists, soil scientists, foresters, geologists,etc.) Final adjustments to fit the BMP prescriptions to the site conditions and needs are made before implementing the resource activity.

When the resource activity (e.g., timber harvest or road construction) begins, timber sale administrators, engineering representatives, resource specialists, and others ensure that the BMP's are implemented according to plan. A similar implementation process is used for other resource activities (range treatments, mining exploration and development, etc.) on National Forest lands.

BMP implementation monitoring is done before, during, and after resource activity implementation. This monitoring answers the question: Did we do what we said we were going to do? Some examples of implementation monitoring for a streamside management unit BMP prescription may be:

Before Project

Checking Streamside Management Units (SMU's) to see if timber sale layout meets the objectives of the BMP prescription, or if the road crossing of a stream is properly located and designed relative to the estimate of potential environmental effects made during the environmental analysis. Items reviewed in the sale layout often include which trees are selected in the "individual tree marking" of the SMU, and location of the SMU's upper unit boundary.

During Project

During timber felling, the timber sale administrator checks to see if the timber fallers understand the marking prescription for timber to be felled in the SMU. The timber sale administrator also observes on-going harvest operations to see if the activity meets the objectives defined in the environmental document and accompanying project plan.

After Project

Measuring stream shade canopy to determine if the amount specified in the BMP prescription was retained, or monitoring a beneficial use of the water to determine a change or trend in use.

Enforcement is carried out primarily through internal project reviews and during contract administration, i.e., assuring that timber sale contract, grazing or special use permit, etc. are adhered to and accomplished per agreement.

Contract enforcement is a more formal method used to achieve desired results. Normally, each project is assigned to a contracting officer. For timber sales, that person is called a timber sale administrator. The project is routinely monitored to ensure that practices are being carried out in the manner and method prescribed in the contract, permit, etc. When a contractor or permittee is not in compliance, they can be held in breech with penalties (e.g. bond forfeiture) until remedies are implemented.

Often during the course of an activity, adjustments are made if it is determined that unsatisfactory results are occurring or may occur from continued operation. This often requires that the contract be modified to resolve or minimize the problem (as in the case of a timber sale). Under some conditions where resolution of a problem is not possible, contract termination could result. While

this is used very sparingly, the provisions to do so are within the contract.

BMP Monitoring - Step 4

Once BMP's have been implemented, further monitoring is done to evaluate their effectiveness. BMP "effectiveness monitoring" answers the question: Are BMP's effectively meeting management objectives for protection of water quality?

Water quality standards are the "yardstick" against which the effectiveness is tested. If through objective monitoring BMP's do not meet the prescribed objectives, then information is available to modify either the BMP's for future management application, or the objectives, or both.

The natural variability of water quality under undisturbed conditions is an important factor that will be considered during the monitoring and evaluation. Additionally, effectiveness monitoring will include measurement against land management objectives as well as water quality objectives.

Some examples of the types of BMP effectiveness monitoring to be conducted are:

- Measuring stream temperatures to see if the riparian prescriptions in a watershed are maintaining water temperature.
- Surveillance monitoring of a road system during storms to see if road rocking is effectively preventing road surface erosion.

The monitoring and evaluation section of the Forest Plan (Chapter V) provides that monitoring will be done on an appropriate sample basis. Once a specific project is designed, a site-specific monitoring plan may be developed.

Results of monitoring should be shared with State and local agencies, as well as made available to the public. Monitoring design, sampling, and laboratory analyses will be coordinated.

BMP Evaluation and Adjustment - Steps 5 and 6

The technical evaluation/monitoring described above will determine how effectively BMP's protect and/or improve water quality. If the evaluation indicates that water quality objectives are not being met and/or beneficial uses do not appear to be receiving adequate protection, corrective action will consider the following three components:

The BMP: Is it technically sound? Is it really best, or is there a better practice which is technically sound and feasible to implement?

The Implementation Program or Processes: Was the BMP applied entirely as designed? Was it only partially implemented? Were personnel, equipment, funds, or training lacking which resulted in inadequate or incomplete implementation?

The Water Quality Standards: The water quality standards are established to protect the beneficial uses of water. They include numeric and narrative criteria that, when exceeded, are assumed to indicate detrimental impacts on beneficial uses. They are intended to provide a benchmark for evaluating harm to beneficial uses.

Assessing the applicability of the standards is a responsibility of the State. The Forest Service will provide information to the State to address the following types of questions:

- Do the standards describe the conditions necessary for protecting beneficial uses?
- Are standards higher or lower than that necessary for protecting beneficial uses?
- Do the standards reflect the natural variability occurring within the natural and human-affected ecosystem?
- Do the parameters and criteria that constitute water quality standards adequately reflect (are they sensitive enough) human-induced changes to water quality and beneficial uses?

To make this assessment, validation monitoring may be needed. The purpose of validation monitoring is to answer the question whether standards, coefficients, requirements, and guidelines are appropriate to meet objectives, e.g. to protect the established beneficial uses.

Examples:

- Did the change in water temperature impact the fish population?
- Did the soil compaction affect tree growth?

Validation monitoring will need to be closely coordinated with or, in some cases, conducted by research. It may require the establishment of permanent plots or administrative studies. This kind of monitoring will be generally quite limited and will require good coordination to properly select projects that will have broad application and prevent duplication of efforts. Only those coefficients and standards that are not reasonably

validated by existing research or documentation should be candidates for this monitoring.

Corrective action may be initiated once the reason for failing to achieve the management objectives is determined. The management practice may have to be changed, the water quality objectives modified, or both.

Training

National Forest personnel involved with project planning and location, design, layout, administration, and maintenance activities will receive BMP training. The training will consist of BMP awareness, accompanied by the more technical aspects such as planning, implementation, monitoring and evaluation.

General Best Management Practices and Examples

Individual general Best Management Practices are described in General Water Quality Best Management Practices, Pacific Northwest Region, November 1988.

Included in the General Water Quality Best Management Practices document is a description of the process and limitations and use of these BMP's. This document, while providing guidance, is not considered direction.

Specific evaluations of effectiveness and ability to implement each general BMP are performed at the project level, following site-specific prescriptions. The sensitivity of the project determines whether the site-specific BMP prescriptions are included in the environmental documents (EA or EIS) or in the sale project plan (or analysis files).

Evaluations of the ability to implement and estimated effectiveness are most appropriately made at the project level. At the project level, the greatest level of precision in the expected effectiveness of a BMP can be made as site-specific conditions are essentially "knowns" (i.e. the change of significant variance in the estimate is greatly reduced).

For the more general BMP, the effectiveness and ability to implement can be estimated with some degree of precision. However, as the BMP is applied to larger areas or outside the physiographic areas for which it was developed, the rating of effectiveness and ability to implement is more a professional estimate that encompasses the many variables under which it would be applied. For Forest Plans, this estimate is fairly reliable as resource conditions are well defined; any substantial variation in conditions would likely be accompanied by either an additional BMP, or accounted for in the BMP prescription when applied at the project level. Criteria for rating the ability to implement and effectiveness of general BMP's is included at the end of this appendix.

Not all of the general BMPs listed will normally apply to a given project, and there may be specific BMP's which are not represented by a general BMP in this document. During the monitoring activity, reference should be made to the Forest Plan monitoring resource element - Water Resource Monitoring.

Format of BMPs at Forest Plan and Project Levels

Each general and site-specific Best Management Practice (BMP) consists of the Title, Objectives, Explanation, Implementation and Responsibility, Ability to Implement, Effectiveness, and Monitoring. Each section with a brief description follows:

Title: Includes the sequential number of the practice and a brief title.

Objective: Describes the objectives of the Best Management Practice (BMP) and the desired results for protecting water quality.

Explanation: Further defines the brief title, and describes under what conditions and how the practice is applied. Criteria or standards are described when applicable. This section contains a description of the range of site-specific water quality protection measures to be implemented.

Implementation and Responsibility: Describes how the practices are expected to be applied and identifies the person(s) responsible for implementing the BMP.

Ability to Implement: Provides a qualitative estimate of the ability of the Forest Service to implement the BMP. The estimate is made at either the project level or Forest Plan level. Criteria for rating the ability to implement general BMP's is included at the end of this appendix.

Effectiveness: Provides a qualitative assessment of the expected effectiveness that the applied measure will have on preventing or reducing impacts on water quality and beneficial uses. The effectiveness of each BMP will be evaluated with an index that rates the effectiveness of each BMP at either the project level or Forest Plan level. Criteria for rating effectiveness of general BMP's is included at the end of this appendix.

Monitoring: Either describes how the site-specific practices for this BMP will be monitored, or lists the appropriate section of the Forest Plan Monitoring Plan that would verify implementation and/or effectiveness.

Criteria for Rating "Ability to Implement" and BMP "Effectiveness"

These estimates are general, given the range of conditions throughout the Forest. More specific estimates are made at the project level when the specific BMP's are developed.

Ability to Implement

Provides a qualitative estimate of the ability of the Forest Service to implement the BMP. The following index is used to rate the ability to implement as either High, Moderate or Low:

High: Almost certain the BMP can be implemented as planned.

Moderate: Greater than 75% certainty the BMP can be implemented as planned.

Low: Less than 75% certainty the BMP can be implemented as planned.

Effectiveness

Provides a qualitative assessment of the expected effectiveness that the applied measure will have on preventing or reducing impacts on water quality and beneficial uses. The effectiveness of each BMP will be evaluated with an index that rates the effectiveness of each BMP as either High, Moderate, or Low. The index is:

Effectiveness of the BMP as indicated by literature & research, administrative studies, and professional experience.

High: Practice is highly effective (90%) and one or more of the following types of documentation are available:

- Literature/Research - must be applicable to area.
- Administrative studies - local or within similar ecosystem.
- Experience - judgment of an expert by education and/or experience.
- Fact - obvious by reasoned (logical) response.

Implementation and effectiveness of this practice will be monitored and the practice will be modified if necessary to achieve the objective of the BMP.

Moderate: Documentation shows that the practice is effective less than 90% of the time, but at least 75% of the time; **or** logic indicates that this practice is highly effective, but there is little or no documentation to back it up.

Implementation and effectiveness of this practice will be monitored and the practice will be modified if necessary to achieve the objective of the BMP.

Low: Effectiveness unknown or unverified, and there is little or no documentation; **or** applied logic is uncertain in this case, or the practice is estimated to be less than 75% effective.

This practice is speculative and needs both effectiveness and validation monitoring.

Appendix I

Harvest Methods and Silvicultural Systems

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Introduction and Summary

Harvest methods exert a powerful influence over forest conditions and the Forest's ability to provide products, services, amenities and environments. Choosing the system with the best combination of outputs people want is one of the most frequent and important land management decisions.

People often suggest that the Forest Service should favor one harvest method or silvicultural system over another, implying that one method could provide the best management of the entire Forest. But the Forest is wonderfully varied, and it is managed to achieve many different objectives. No single practice can meet everyone's needs applied uniformly across the range of conditions found on the Mt. Hood National Forest.

This appendix describes the primary harvest methods available, provides a comparison of systems and anticipated results of each. Terminology and the scientific basis for these methods is consistent with Agriculture Handbook 445, "Silviculture Systems for the Major Forest Types of the United States" (Burns, 1983), and General Technical Report WO-55 (Burns, 1989), "The Scientific Basis for Silvicultural and Management Decisions in the National Forest System."

Regulations (36 CFR 219.27(b)) provide criteria for vegetative manipulation, leading to the selection of different methods for different combinations of management objectives, site characteristics, and stand conditions.

Each system may be used when it best meets the combination of site conditions and resource objectives. The land itself provides solution to the "best management" puzzle.

Recommendation of a silvicultural system and harvest method for a specific site is best made in the silvicultural prescription, as provided in the management standards and guidelines 1-1, of the Regional Guide for the Pacific Northwest Region, 1984 (USDA-FS, 1984). Final selection is made by the responsible line officer in a Decision Notice or Record of Decision after considering all resources and public concerns.

Uneven-aged management will be used most often on sites that already have uneven-aged stand structures, or which naturally tend toward uneven-aged development, as in the climax pine communities on the east side of the Forest.

Even-aged management will be commonly used, because it is often the optimum method in the particular set of environmental conditions and management objectives prevalent over much of the Mt. Hood National Forest. Clearcutting will be the harvest method most often chosen. It has been said *"These decisions originate in the practice of the art of forestry"* (Brodie, 1981). Professional judgments about the steepness of terrain, propensity of some species to windthrow, the value and characteristics of species most likely to regenerate, and a host of other factors influence this choice.

Congress has made the will of the people known through the National Forest Management Act, which requires that clearcutting be used only where it is the optimum method. Recent trends in "New Forestry" or "New Perspectives Forestry," suggest that the margin between clearcutting and other methods will become very blurred indeed. We don't yet know the outcome of the political and social processes coming to bear on forestry practices. One thing is certain, though: clearcuts of the future will be very different from those of the past.

Classification of Timber Stands

Stands of trees are often classified in either of two main categories: even-aged, or uneven-aged. The distribution of numbers of trees from the youngest to oldest is called the "age-arrangement" or "age-class structure."

In even-aged stands, the ages of trees are grouped around the average age within a relatively narrow range. For example, the oldest trees might be no more than 20 years older than the average and the youngest trees would be no more than 20 years younger. In very mature even-aged stands, the range of ages may well be broader.

In uneven-aged stands there are at least three age-classes present, and there may be a continuous array of ages from the youngest seedlings to the oldest mature trees. Some uneven-aged stands have a balanced age arrangement, while others have an unbalanced or grouped age arrangement.

A "balanced" uneven-age stand would likely have as many trees of each age class as a balanced "forest" of the same size, composed of many even-aged stands of equal area, each containing one of the same age classes present in its uneven-aged counterpart. Each age class is fully using the space available to it, so the youngest class would have many small trees, and the oldest would have few large trees. Theoretically, there is an equilibrium between growth, harvested yield, and reproduction in balanced uneven-aged stands. In practice, this is an ideal condition that is almost never fully achieved.

"Unbalanced" uneven-age stands have a surplus of trees in one or more age-classes. A surplus in one part of the distribution can exist only if there is a compensating deficiency in another. Thus, regulation of cutting in uneven-aged stands requires accurate knowledge and great skill to allocate the cut among the various age classes, if the objective is a relatively even-flow of harvest over time.

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

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 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 less valuable or undesirable trees from an uneven-aged stand to favor more valuable trees, without any attempt to foster regeneration.

New Perspectives Forestry

The preceding discussion describes classical forestry methods originating at the very dawn of forest management centuries ago in Germany. These methods have a sound scientific background, but modern forest management demands even more creative solutions. We have new knowledge now, and new pressures to meet social values as well as our commodity needs.

The Mt. Hood National Forest has initiated a New Perspectives Forestry Program. While still in its infancy, many concepts and practices of "New Perspectives" will be used.

The concepts of "New Forestry" or "New Perspectives" forestry are oriented around the science of ecology,

which is the study of inter-relatedness of living and non-living elements of the earth's systems. The primary questions of ecology are:

- What are the elements of a system?
- What kind of work does each element do?
- What does it contribute to the system?
- What are the dynamics of the system - how do the pieces fit and work together?

Ecosystem management would perhaps be a better term for this point of view than "New Forestry".

This evolution of forest management works with linkages within forest ecosystems, rather than treating them as independent elements. It does not discard the old classical methods but builds on them. It can become incredibly complex. It requires creativity at the genetic, population, stand, community, landscape, social and economic levels all at once. The perspective of time introduces an infinite set of possible futures.

The classical forestry methods provide framework needed to deal with this complexity. New perspectives forestry is an extention of them, not a departure.

How Management Goals and Objectives Affect Choice of Harvest Method

Forest-wide

The choice of harvest method is profoundly influenced by the Desired Future Condition, Management Area goals and objectives, and Standards and Guidelines. The Management Areas which contribute some programmed timber harvest are planned for a fairly high level of intensive management. There are also goals for providing habitats for all native wildlife species, protecting soil and water, and providing recreation opportunities. The choice of treatments should be a combination which best meets the combination of objectives in the most cost-efficient way.

Management Areas

Some of the management objectives relating to selection of harvest method vary by the Management Areas defined for alternative land allocations. Some Management Areas do not have objectives for timber management and any incidental harvest would be designed to achieve specific objectives for another resource. Management Areas suitable for timber production are: B1 through B12, and C1. Although all of these areas are managed for multiple-use, the emphasis or priority changes from one Management Area to the next.

Management Area C1 - Timber Emphasis

This is the major timber producing area of the Forest. The primary goal is full yield of timber within the capability of the land and other resource requirements. Timber harvest is programmed on suitable lands throughout the area. This area provides many recreation opportunities. It also provides habitat for many species of wildlife and is particularly important for specialists using canopy openings and early seral vegetation.

This area still contains a great deal of mature timber in stands which originated in the 19th century, or even earlier. Young stands will be managed to make sure growth occurs in the form of usable wood volume. Managed stands should be relatively free of significant vegetative competition, and should contain enough good quality stocking to make full use of the site. Losses to destructive agents such as wind-throw, animal damage, and disease should also be minimized.

The silvicultural systems and harvest methods chosen will usually be slanted toward combinations which best meet timber production goals.

Management Area B1 - Wild, Scenic and Recreation Rivers

While there is no chargeable timber harvest in the Wild River segments of Category B1 lands, the Scenic and Recreational segments are suitable for timber production at a reduced rate.

Choice of harvest method is highly dependent on the river values, with a primary objective of maintaining appropriate forest cover. Often uneven-aged principles will be applied, especially in areas that are visible from travel corridors. Even-aged management principles may be considered in areas hidden from travelers on the rivers, roads or trails in this Management Area.

Management Area B2 - Scenic Viewsheds

This allocation has more available area and volume than any of the other Management Emphasis Areas. All silvicultural systems and methods will be considered, with special attention to uneven-aged management where it best meets all management objectives.

Lands in the Scenic Viewshed allocation are usually adjacent to or visible from major travel routes, rivers, and other high-use recreation areas. The principle objective is to provide attractive scenery. Multiple-use goals also include the production of wood products, maintenance of wildlife habitat diversity, and protection of watershed resources. Management activities will be designed so they do not dominate the landscape and are not easily seen by the casual forest visitor.

In order to achieve the principal objective, lands in this allocation will be managed with limits on the amount of disturbed area present at one time. Clearcuts or other created openings will be designed to resemble natural openings. In foreground areas, large trees are usually needed for a very long time. Long rotations will be needed to produce the size of tree and the forest character needed. Cultural practices such as precommercial and commercial thinning may be useful at times to hasten development of large trees.

Areas considered for the Partial Retention Visual Quality Objective are visible from major and secondary travel routes, rivers, and other high use recreation areas (often in the middle to background). The main objective is to provide attractive scenery. Multiple-use goals for these areas also include production of wood products, maintenance of wildlife habitat diversity, and protection of watershed resources.

Management Area B3 - Roaded Recreation With Reduced Timber Emphasis

This is a very small allocation, with limited timber objectives. The full range of silvicultural systems including uneven-aged management may be considered to keep timber harvest subordinate to the recreation use of the allocation.

Management Area B4 - Pine Oak Habitat

The management philosophy for this allocation revolves around the needs of silver gray squirrel, turkey, deer and elk. While either even- or uneven-aged management may be used, silvicultural strategy is usually congruent with the need to maintain some mature pine and oak to benefit animal populations. Uneven-aged management is often best.

Management Area B5 - Pileated woodpecker-pine marten Habitat

This is a significant component of the total area managed for special emphasis. It does contribute timber volume, but objectives for maintaining the proper habitat preclude very much intensive management. The closed-canopy, large-tree character needed calls for very long rotations, with little or no intermediate harvest entries before the stands are eligible for regeneration.

Since a multi-layer canopy is one of the desired habitat characteristics, uneven-aged management could be employed to change the stand structure in the desired direction. However, the impetus for this treatment must come from the needs of wildlife, not from timber harvest objectives.

Management Area B6 - Special Emphasis Watersheds

Water quality and riparian management objectives drive the selection of harvest method in this Management Area. All methods are eligible for use as long as the principle objectives are met.

Management Area B7 - General Riparian Areas

The areas allocated to the General Riparian component are intended to ensure good quality water that has the correct temperature gradient for salmon, steelhead and native trout. Management objectives for General Riparian lands are difficult to generalize because the lands are hard to measure and describe, and they are often associated with lands that must be managed for maximum timber production. The primary goal for management is to maintain the integrity of the riparian ecosystem which includes streambank stability, vegetation, and terrestrial and aquatic habitats.

The full range of silvicultural systems and methods may be employed, depending on local conditions. Activity in the General Riparian Area must be coordinated with activity in adjacent Timber Emphasis lands to avoid unacceptable complications for either area.

Management Area B8 - Earth Flows

Earth flow lands are often very productive because soils are deep and have plentiful moisture for tree growth. The principal objective is to avoid initiating catastrophic soil movement so the lands will remain productive. The

strategy to achieve this objective is to make sure most of the soil is fortified with strong, live root systems at all times.

All silvicultural systems and methods are eligible for consideration, within constraints imposed on total area with less than 30 year-old tree cover. Precommercial and commercial thinning may be useful tools to hasten the development of strong root systems, and may also help extend the longevity of tree cover when needed.

Comparison of Methods

This comparison is provided to aid understanding of the thought processes leading to the selection of a harvest method. The discussion relies on experience in forest management on the Mt. Hood Forest and definitive research when available, or on generalized silvicultural principles. The comparative evaluation focuses on factors specific to the Mt. Hood National Forest. Differences between even-aged and uneven-aged management are emphasized more than the intricacies of variations within them. The discussion is general; many exceptions would be expected in specific situations.

Vegetative Diversity

Vegetative diversity can be broken into three parts for discussion: species diversity, genetic diversity, and structural diversity over time and space.

Species Diversity

Species diversity refers to the array of plant species present within timber stands. Species diversity depends on the specific environment, how the stands have developed, and what happens to them during management. On most lands east of the crest of the Cascade Range, uneven-aged management would shift the species composition in favor of the shade tolerant species (Gordon, 1978, Franklin, 1978). Group-selection would provide enough sunlight to allow some shade-intolerant species, but single tree selection would lead to a complete shift to species which can reproduce and thrive in shade.

Even-aged systems can either decrease or increase the species diversity on a given site, depending on selection of species for planting, success of the planting, and success and variety of natural regeneration. Often when one or two major species are selected for planting, minor species become established from natural seeding. Species diversity can be controlled by leaving seed trees of selected species, designing for seeding from adjacent stands, or by prescribing species consideration during stocking level control. If regeneration fails, diversity may be reduced and species that were minor components of previous stands may predominate. An example of this occurs in high elevations on the Crest, where lodgepole pine can survive under extremely harsh environments where other species fail.

Genetic Diversity

Genetic diversity refers to the amount of variation in the basic building blocks of life itself. Some of these building blocks -- the genes of living organisms -- combined with effects of the environment, produce characteristics in living organisms that we can see or measure. Some characteristics, such as amount of growth or quality of wood, may be of particular management interest. Our ability to change or improve characteristics we want depends on having a wide range of genetic variation to draw from.

Genetic diversity can be influenced by any silvicultural practice either positively or negatively depending on the care with which the treatment is used. When regeneration is successful from a local seed source with a large number of parents, the diversity of the gene pool is not significantly changed. There are a number of ways in which the genetic diversity or quality may be reduced. Regeneration failures with any of the systems could result in a loss of diversity for those species that fail.

Harvest methods that remove the largest and highest quality trees (high grading) could result in degradation of the genetic quality of the remaining stand.

If regeneration is produced from a small number of parents or isolated trees, there is increased risk of inbreeding or overall constriction of the gene pool. Natural or artificial regeneration from a large number of parents exhibiting desirable characteristics of growth and form can maintain a broad genetic base, and move the genetic composition toward a higher frequency of desirable traits. Regardless of the system, genetic diversity is an important management objective.

Structural Diversity

Structure is just another name for the physical description of timber stands -- whether there are many or few plants of a given size, age, or crown class and whether there are many different sizes present. Diversity varies both horizontally and vertically, and within stands as well as between stands.

Even-aged stands have little vertical or horizontal diversity within their boundaries. They tend to have a single dominant layer of trees, all nearly the same age. Older stands may or may not develop understories of shrubs or young trees. Managed stands tend to have less understory because the dense crown canopies prevent sufficient sunlight for shrub and tree growth from reaching the ground. Diversity in the horizontal plane at the Management Area scale is often great, with many stages of development interspersed across Management Areas where timber management is practiced.

Uneven-aged management creates great vertical diversity within each stand. There may be an array of sizes and ages from seedlings or young saplings to trees near rotation age. If large areas were managed on an uneven-aged basis, all the stands would eventually have similar structure and differences between stands would be minor.

Visual Resource

Any of the methods may be appropriate to achieve the desired character depending on circumstances. Uneven-aged management may be useful for creating or maintaining naturally appearing landscapes, particularly in the foreground viewing area. Although activities may be widespread, the change in character is more subtle to the casual forest visitor compared with even-aged openings.

On the other hand, vast areas of uneven-aged stands would have little visual diversity. Even-aged systems may enable the creation of designed openings or the reshaping and enhancement of existing ones. The differences between clearcut and shelterwood are short term. Initially they may appear to be quite different, but shelterwood trees left at the first entry will be removed when the regeneration is quite small, so that seedlings will not be damaged. Once the shelter trees are removed, the appearance is little different from that of an ordinary clearcut. Shelterwood units must be designed to meet visual quality objectives after the shelter trees are removed.

Wildlife Habitat

All forest conditions provide habitat for some type of wildlife. Management that favors one species group will be unfavorable for some other group. Most wildlife species are adapted to thrive under conditions of specific structure and species composition. For example, a mosaic of openings and cover, such as that created by even-aged systems, is optimum for species such as deer and elk, that forage on herbaceous and shrubby vegetation produced in openings (Witmer and others, 1985). Uneven-aged or multi-layered stands with substantial vertical diversity favor species such as tree squirrels and spotted owls. Yet others, such as soaring hawks, require large openings and do poorly if they don't have openings.

The selection of harvest method will influence proportions of species and when and how they use stands as habitat. Even-aged management with a mosaic of diverse stands would provide habitat for a large number of species as stands progress through various seral stages (Logan and others, 1985; Thomas and others, 1975). If large contiguous areas are managed with uneven-aged management, habitat diversity could be significantly diminished (Hall, McComb, and Ruediger, 1985). A mix of silvicultural methods, with the vertical diversity of uneven-aged stands and the spatial diversity created by even-aged blocks, might well produce the balance of habitat that would best achieve wildlife management objectives.

Fisheries

Continuous vegetative cover is needed along perennial streams for shade and streambank stability. Even-aged management may not always provide this continuous cover. The single-tree selection or group selection methods may be appropriate for managing these areas while maintaining protective cover. Entries in these riparian "strips" will generally need to be coordinated with entries on adjacent areas. Uneven-aged prescriptions with regular cutting cycles and intensive cultural treatments would not be feasible. The only feasible timber management may be modifications of traditional methods; designing prescriptions to take advantage of opportunities as they occur over the long term.

Soil and Water

The risks of soil and water impacts are often more a function of the watershed characteristics and the logging and roading methods used, than the silvicultural system. Possible adverse effects are erosion, sedimentation, landslides, soil compaction, and loss of productivity through soil or nutrient loss.

The risk of erosion and landslides increases with the amount of protective vegetation and surface litter removed. This risk may be greatest with the clearcutting method because more cover is removed at one time. Other even-aged methods may be as high depending on the amount of clearing done to prepare the sites for seedling establishment. The risk would be lower for the selection systems for any one treatment entry; however, the loss of soil by erosion may be offset by increased entry frequency. Repeated logging at ten to twenty year intervals could keep soils of landings and skid roads exposed a high percentage of the time and result in more erosion over the long term than the even-aged systems with one or two thinnings and the final harvest for each rotation.

The risk of soil nutrient loss also increases with the amount of vegetation and litter removed. Again, the risk for any one entry is greater from the even-aged systems because of the greater degree of clearing. Clearcutting with yarding of cull material and burning of residue has the greatest potential for significant nutrient reduction. However, the effects on long term cycles of nutrient capital that might result from any of the harvest methods is not well understood.

Frequent and extensive use of heavy equipment has the potential to cause significant compaction of some soils. This is predominantly a function of the logging method, timing of activity, and soil types rather than the harvest method. However, under uneven-aged management, there may be incentive to use more ground-based logging systems to accomplish selection harvests than even-aged management, and the risk of soil compaction would be increased.

Applying uneven-aged management to extensive areas on this Forest would also result in the need for much higher road densities. With the greatest soil and water impacts coming from roads, any on site advantages of uneven-aged management would be more than offset.

Fire and Fuels

Considerations for fire and fuel management fall in two broad categories; ability to control or manage wildfires, and ability and efficiency of treating fuels to manage risk of large wildfires. A mosaic of stands under even-aged management would contain breaks in spatial fuel patterns that would provide opportunities for management or control of wildfires. Uneven-aged methods would produce contiguous areas with fairly high fuel loadings and continuous vertical fuel ladders. These fuel ladders created by multiple tree layers carry ground fires into the crowns of the large trees. Under these conditions, crown fires could be expected more frequently, and fires would tend to be larger and burn at higher intensities. Control would be more difficult and costly and resource damage would likely be increased.

Treatment of activity created residue fuel is easier and more cost efficient with even-aged methods, particularly clearcutting. Treatments following final harvests can be prescribed without the added complication of protecting residual crop trees. This facilitates the creation of breaks in the fuels complex as described above. Effectively treating residue fuels in uneven-aged management would be more difficult and expensive. Providing the necessary protection for the younger residual crop trees would severely restrict treatment options. Because of the greater difficulty and higher cost, increased accumulation of fuels should be expected if significant acreages are managed with the uneven-aged methods.

Timber

Several important aspects of timber management are influenced by the selection of silvicultural systems. The implications for forest regulation, the mode of operations, the complexity of administration, and yield that can be produced are important considerations.

Regulation

A fully regulated forest has a balance of stands capable of supporting continuous production and harvesting at the long-term sustained capacity. Ideally, approximately the same number of acres would be harvested each period. Complexities of modern forest management including Management Area objectives, retention of green trees to meet a Desired Condition, and "New Perspectives" forestry trends suggest regulation in the classical sense may be an elusive goal.

With uneven-aged management, all acres would be harvested at ten to twenty year intervals with approximately equal yield from each harvest. With even-aged management, stands would be harvested around the Forest to

produce an equal yield in all periods. Since the Mt. Hood National Forest currently has an imbalance toward older stands, several decades will be needed before regulation is fully achieved.

Regulation can be achieved most easily with even-aged management for several reasons. Inventory information with the resolution necessary to plan and schedule selection harvests is not readily available for much of the Forest; detailed information about the trees available for cutting would be needed on a stand by stand basis. Most of the existing mature stands do not have the crop tree stocking needed to get them into a productive condition; regeneration would be needed to realize significant growth in these stands. To achieve growth equivalent of that possible with even-aged methods, many more acres would have to be entered under uneven-aged management. Attempts to move stands toward uneven-aged structures would result in sites being occupied by very slow growing trees for several decades as regeneration of various ages is incrementally added through repeated treatments. The transition of essentially even-aged stands to balanced uneven-aged form might well require several rotations (Smith, 1962). Another factor that can affect regulation is the occurrence of wildfires or other natural events which result in the regeneration of even-aged stands. It would be difficult to regulate a forest under a selection system when significant acreages of unplanned even-aged stands occur.

Operations

The choice among kinds of management also influences several aspects of harvesting and other treatment operations. Uneven-aged management tends to be much less efficient with many more acres harvested and many more miles of road needed to yield the same volume and a wide variation in tree size which precludes matching harvesting equipment for maximum efficiency. In contrast, whole stands of even-aged trees can be harvested with equipment that best provides efficient handling of a particular tree size.

The shelterwood method has the advantage of uniform tree size, but some efficiency is lost due to the second operation needed to remove the shelter trees left in the first entry. This splits available volume into two operations, essentially doubling many of the cost items. In addition, there is the added risk of mortality or damage to the seedlings from removing the residual shelter trees after the regeneration has become established. This is a critical step in the shelterwood method and often is the most difficult to achieve. This is particularly true on this Forest where many slopes are steep and convex; poor deflection for cable logging poses a difficult situation to protect established seedlings from moving logs and cables.

Treatments of uneven-aged stands are even more complex. Crop trees must be individually selected from a variety of sizes, ages, and species; and their care and protection integrated in all operations. This applies to activities such as fuel treatment, site preparation, release, and precommercial thinning as well as timber harvests. Again, with uneven-aged management, large acreages would need to be covered to achieve a modest gain due to the interspersing of treatment opportunities throughout larger stands. In many cases the treatments needed to achieve optimum production may not be feasible. For example, treating residue fuels may subject residual crop trees to unacceptable risk if fire is part of the treatment prescription, or treating competing vegetation to release individual crop trees may be too expensive to consider.

Administration

There is a significant difference in the record keeping, inventory, and project administration requirements between uneven-aged and even-aged management. The detailed information needed to plan and carry out treatments, as well as the frequency of treatments, makes uneven-aged management more costly (Alexander and Edminster, 1979). More accuracy is needed in the inventory information to prescribe harvest from several tree classes. To achieve this resolution in data collection, stand stratification must be done to finer detail resulting in many more stands to inventory, keep records on, and administer. Even with computers for data management, the level of complexity would quickly become cumbersome.

Yield

Research studies to compare long-term wood production associated with the different silvicultural systems have not been completed, although some studies are under way in other forest types. Theoretically, total production could be greater for the selection systems because continuous stocking of trees is maintained on the site; however, many operational and managerial factors influence actual production of merchantable stand growth and timber yield (Curtis, 1978). Several factors affecting yield have been mentioned in previous sections: the feasibility of cultural treatments such as release and precommercial thinning, the shift in species composition toward more

shade tolerant species, and the risk of logging damage to the crop trees planned for retention.

There is also increased risk from disease as a result of logging damage and the carry-over of disease from one generation to the next associated with uneven-aged systems. In contrast, even-aged management creates a break in many disease cycles not unlike the natural events (fires) that created even-aged stands in the past. While some diseases may carry over through inoculum in the soil, others such as dwarf mistletoe, would be effectively eliminated or controlled by a break in the presence of conifers.

Generalizations about the risks from insect or wildlife pests associated with the choice of harvest method are difficult. Healthy vigorous trees are usually less susceptible to pests than those that are wounded or stressed. Well managed stands under any of the systems, with a diversity of species and vigorous trees, will have less risk of significant pest damage. The risk of logging damage to residual crop trees with uneven-aged management is a critical factor on many sites. With steep slopes and long yarding distances, it is difficult to remove large trees without damaging leave trees. Wounds become the entry points for insects and fungal diseases which cause decay and loss of wood volume. This is particularly critical with susceptible species, such as silver fir and western hemlock, which may be favored during regeneration in the environment created by uneven-aged management. There is also risk of logging damage to crop trees during commercial thinnings in even-aged management. However, the risk of damage is not as great since harvest trees would not be substantially larger than the crop trees; and the effect of damage is not as significant because crop trees need to last only the remaining part of the rotation from thinning to final harvest.

Treatments to control competing vegetation will be needed in some cases regardless of the harvest method if regeneration survival and growth is to be assured. It has been suggested that the need for control of competing vegetation would be less with alternatives to clearcutting. There are no scientific studies to demonstrate this and the theoretical basis for the assertion does not seem to hold true on this Forest. Maintaining a continuous tree canopy would reduce the number of grasses, forbs, and shrubs; but this is because less light, moisture, and nutrients are available. These are the same resources needed by the young conifers. The competition for the available site resources would be just as severe under methods that retain part of the older stand. In addition, the operational feasibility of treatment would be diminished.

The operational feasibility of other treatments designed to maintain or increase growth would also be diminished with uneven-aged systems. Scattered needs for precommercial thinning or planting to achieve optimum production would likely not be treated. Genetic gains through planting of genetically improved seedlings would not be realized to the same extent.

Economic Implications

Many factors affecting operational efficiency have economic implications. The size of the treatment area is a major factor in cost determination and efficiency. Costs per acre for management treatments generally increase as harvest unit size decreases. This is true for logging costs as well as most cultural treatments. Logging costs are also increased for uneven-aged systems due to the added complexity of harvesting needed to protect residual crop trees that are small and vulnerable to damage. Administration costs would also be much higher for uneven-aged management.

In even-aged management, clearcutting is usually the most economically efficient method. The need for removal of the shelter trees in a second operation with the shelterwood method, or the potential loss of wood volume with the seed-tree method if seed trees are left on the site, make these methods more costly. Exceptions would include those sites where regeneration would be difficult and more expensive to achieve with the clearcut method. However, this should be evaluated carefully for each site; it may be cheaper to invest in artificial shading for seedlings than to use the shelterwood method (Tesch, 1984).

Theoretically, the cost of natural regeneration could be less than that of artificial regeneration. The costs of seed collection, nursery operations, seedling handling, and planting are significant. However, the uncertainty of natural regeneration for much of the Forest is a risky proposition with several complications.

Sporadic seed crops and the variation of extreme weather team up with the competition of sprouting shrubs and other vegetation to delay or prevent natural regeneration. After sites are taken over by shrubs and hardwoods, it becomes much more difficult and expensive to achieve reforestation. Often additional site preparation and planting are needed to accomplish the reforestation objectives. In the mean time, potential production from the site has been lost due to the period of inadequate stocking. In addition, the opportunity to improve the genetic composition of future stands

through the use of seedlings from selected parents is lost with exclusive use of natural regeneration.

In general, and without regard to special resource objectives, the cost efficiency of the methods falls into the following order from least cost to most cost: Clearcut, shelterwood, seed-tree, group selection, and single-tree selection.

Social Implications

Some people have a general dislike for clearcutting. They say: clearcuts are ugly; are difficult to reforest; destroy wildlife habitat; damage soil and watershed values; require the high cost of artificial regeneration; cause loss of vegetative diversity; and increase vegetative competition and the use of herbicides. These concerns are valid, but satisfying one may intensify another. For example, reduction of even-aged openings to avoid visual impacts may reduce the forage available for big game, adversely affecting the habitat quality and recreation opportunities for some segments of the population. Also, use of less efficient methods to achieve different environmental effects may result in higher costs or lower outputs with accompanying adverse effects on local or national economies and employment.

The land allocations described for each Forest Plan alternative address these concerns to some degree. The application of some silvicultural methods may be constrained or altered in the different Management Areas in response to these concerns and the various resource needs. Social values derived from the use of the different methods remain a function of personal preference. Each method has a sound scientific basis when applied appropriately and matched to the management objectives and site specific conditions.

New Perspectives Forestry is a philosophy that recognizes people and their cultures and economies are integral parts of ecosystems. What we leave behind on the land - the biological legacy - is as important as what we remove for our use.

Direction and Guidelines

Regional Guide Criteria

The Regional Guide for the Pacific Northwest Region, May 1984, provides selection criteria to guide the choice of harvest method. These criteria will guide the selection of silvicultural systems and harvest cutting methods for site specific prescription. The final selection of harvest method for any specific site will be part of the silvicultural prescription as provided for in Management Standards and Guidelines 1-1, as provided for in selection criterion six. The selection criteria are:

- The selected harvest cutting method must permit the production of a volume of marketable trees sufficient to utilize all trees that meet utilization standards and are designated for harvest.
- The selected harvest cutting method must permit the use of an available and acceptable logging method that can remove logs and other products without excessive damage to the identified desirable residual vegetation.
- The selected harvest cutting method must be capable of providing special conditions, such as a continuous canopy or continuous high-density live root mats, when required by critical soil conditions or as needed to achieve particular management objectives, such as streamside protection, wildlife needs, and visual enhancement.
- The selected harvest cutting method must permit control of vegetation to establish desired numbers and rates of growth of trees, as well as vegetation needed to achieve other management objectives identified in site-specific silvicultural prescriptions.
- The harvest cutting method selected will promote a stand structure and species composition that minimizes serious risk of damage caused by mammals, insects, disease, or wildfire, and it will allow treatment of existing insect, disease, or fuel conditions.
- The harvest cutting method selected must meet resource and vegetation management objectives identified in the Regional Guide and Forest Plans. Harvest cutting methods to be used on specific areas may be identified in Forest Plans, in Environmental Assessments, or in silvicultural

prescriptions that are written or reviewed by a certified silviculturist.

Recommendations

The remaining part of this section pulls together the implications from the previous sections and provides suggested applications of the various harvest methods. The harvest cutting methods identified for the combinations are generally the most appropriate; however, other methods may be used when site specific conditions and objectives require.

The determination of where clearcutting is the optimum method is based on site specific environmental, biological, aesthetic, engineering, and economic factors, and the objectives and requirements of the Forest Plan. Where clearcutting is among the appropriate methods, it will usually be advantageous in terms of engineering and economics. Other methods may have biologic or aesthetic advantages that are predominant on some sites. Shelterwood should be used only where it can meet regeneration goals better than clearcutting, or to accomplish short term mitigation of visual effects of timber harvest.

The identification of clearcutting as the optimum method for sites on the Mt. Hood will often be influenced by the key factors mentioned earlier in this appendix:

- The intensity of vegetative competition.
- The difficulty of protecting residual trees through harvest operations on steep slopes.
- The desirability of perpetuating high proportions of shade intolerant species.
- The difficulty of retaining residual trees through periodic windstorms.

Management Area C1 - Timber Emphasis

This is the major timber producing area of the Forest. The primary goal is full yield of timber within the capability of the land and other resource requirements. The silvicultural systems and harvest methods chosen will usually be slanted toward combinations which best meet timber production goals.

Western Hemlock Zone

Appropriate Methods: Clearcut (shelterwood in certain circumstances).

Pacific Silver Fir Zone

Appropriate Methods: (ABAM/VAME/XETE) shelterwood; (other associations) clearcut, shelterwood

Mountain Hemlock Zone

Appropriate Methods: (TSME/VAME/XETE) shelterwood, single tree selection, group selection; (other associations) clearcut, shelterwood, single tree selection, group selection.

Grand Fir Zone

Appropriate Methods: clearcut, shelterwood, group selection, single tree selection.

Ponderosa Pine Zone

Appropriate Methods: single tree selection.

Douglas-fir Zone

Appropriate Methods: shelterwood, single tree selection, clearcut, group selection.

Management Area B1 - Wild, Scenic and Recreation Rivers

Choice of harvest method is highly dependent on the river values, with a primary objective of maintaining appropriate forest cover.

Wild Segments

Timber harvest not allowed.

Scenic and Recreation Segments

Appropriate Methods: single tree selection, group selection, clearcut (see Standards and Guidelines).

Management Area B2 - Scenic Viewsheds

All silvicultural systems and methods will be considered, with special attention to uneven-aged management where it best meets all management objectives. Management activities will be designed so they do not dominate the landscape and are not easily seen by the casual forest visitor.

Foreground Retention

Appropriate Methods: single tree selection (see Standards and Guidelines for limits on other methods).

Middleground Retention

Appropriate Methods: single tree selection, group selection, shelterwood and clearcut (see Standards and Guidelines).

Foreground Partial Retention

Appropriate Methods: group selection, single tree selection.

Middleground Partial Retention

Appropriate Methods: shelterwood and clearcut designed for visual quality objective, group selection, single tree selection.

Middleground and Background Modification

Appropriate Methods: clearcut, shelterwood designed for visual quality objectives.

Management Area B3 - Roaded Recreation With Reduced Timber Emphasis

The full range of silvicultural systems including uneven-aged management may be considered to keep timber harvest subordinate to the recreation use of the allocation.

Appropriate Methods: single tree selection, group selection, shelterwood, clearcut (see Standards and Guidelines).

Management Area B4 - Pine Oak Habitat

Silvicultural strategy is congruent with the need to maintain some mature pine and oak to benefit animal populations.

Appropriate Methods: single tree selection, group selection, shelterwood, clearcut.

Management Area B5 - Pileated Woodpecker/Pine Marten Habitat

Since a multi-layer canopy is one of the desired habitat characteristics, uneven-aged management could be employed to change the stand structure in the desired direction.

Appropriate Methods: single tree selection.

Management Area B6 - Special Emphasis Watersheds

Water quality and riparian management objectives drive the selection of harvest method in this Management Area.

Appropriate Methods: clearcut, shelterwood, group selection, single tree selection.

Management Area B7 - General Riparian Areas

The primary goal for management is to maintain the integrity of the riparian ecosystem which includes streambank stability, vegetation, and terrestrial and aquatic habitats. Activity in the General Riparian Area must be coordinated with activity in adjacent Timber Emphasis lands to avoid unacceptable complications for either area.

Appropriate Methods: single tree selection, group selection, clearcut, shelterwood (see Standards and Guidelines).

Management Area B8 - Earth Flows

Standards and guidelines limit total area with less than 30 year old tree cover. Precommercial and commercial thinning may be useful tools to hasten the development of strong root systems, and may also help extend the longevity of tree cover when needed.

Appropriate Methods: clearcut, shelterwood, single tree selection, group selection.