

United States
Department of
Agriculture

Forest Service

Pacific
Northwest
Region

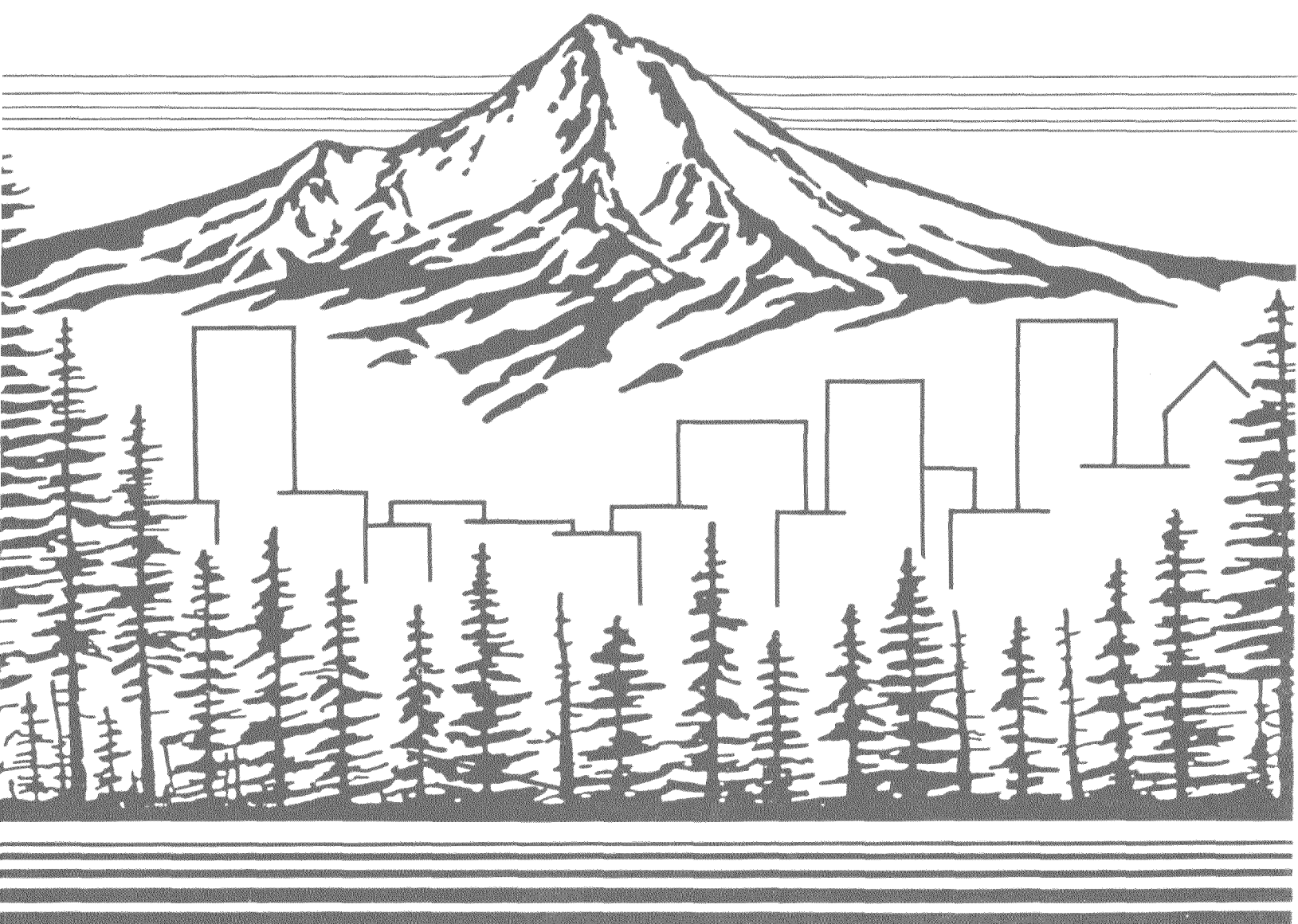
1988



Draft Environmental Impact Statement

Proposed Land and Resource
Management Plan

Mt. Hood National Forest



Dear Reader,

The Draft Environmental Impact Statement: Land and Resource Management Resource Plan represents a milestone in National Forest management. The Forest Supervisor and staff have given Forest Planning a high priority in the last five years. They have been committed to completing the Forest Plans so that we can move into a new era of management.

The Draft Environmental Impact Statement identifies a range of alternative plans for managing the Forest. It also describes a preferred alternative that the Forest Service thinks best treats major issues raised by you and agency employees.

The Reviewer's Guide and Response Form are designed to help you review the planning documents and make it easier for you to respond. We must have your comments by the date shown on the cover page.

This Draft Environmental Impact Statement may be subject to some adjustments pending the decision on the Supplemental Environmental Impact Statement for the Regional Guide for the Pacific Northwest Region.

Your thoughts and concerns are important. I will weigh all public comments carefully. Your comments will help the Forest Supervisor and me to select the best alternative suitable for this National Forest.

JAMES F. TORRENCE
Regional Forester

**DRAFT ENVIRONMENTAL IMPACT STATEMENT
PROPOSED LAND AND RESOURCE MANAGEMENT PLAN**

MT. HOOD NATIONAL FOREST

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

LEAD AGENCY:

USDA Forest Service

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ABSTRACT

The Mt. Hood National Forest is comprised of 1.1 million acres of land in the Cascade Mountains of northern Oregon. Pursuant to the Forest and Rangeland Renewable Resources Planning Act of 1974 (RPA), as amended by the National Forest Management Act of 1976, the Forest Service is considering ten alternatives for managing this land. The alternatives are:

NC- (No Change) Continues existing management and program output levels, without regard to new information or new legal requirements.

A- (No action) Continues existing management, but outputs would reflect adjustments based on new information and new legal requirements.

B- Addresses the fifty-year objectives of the national Resources Planning Act (RPA) Program. It includes a departure schedule for timber harvest.

C- Provides maximum timber volume in the next thirty years, by departing from nondeclining flow.

D- Maintains present harvest levels for the next ten years, by departing from nondeclining flow.

E- Produces maximum timber volume in the first decade, by departing from nondeclining flow. Same land base allocations as alternative G.

F- Maintains natural appearing environment in areas seen from developed recreation sites and roads.

G- Makes adjustments to land uses in existing plans to accommodate recently identified concerns. Timber harvest schedule follows nondeclining flow policy.

H- Retains all remaining unroaded areas and old-growth timber. Maximizes dispersed recreation opportunities.

I- Provides optimal habitat conditions for wildlife and fish species. Maintains dispersed recreation opportunities in all presently unroaded areas.

The Forest Service has identified **Alternative E** as its preferred alternative.

This document presents the results of the environmental analysis of alternative ways of managing the Mt. Hood National Forest for the next 10 to 15 years. Long-term estimates of Forest resources and environmental conditions are analyzed for every alternative. Any alternative adopted as the Forest Plan would apply for no more than 15 years.

Comments on this draft must be received by the Forest Supervisor, Mt. Hood National Forest, 2955 NW Division St., Gresham, OR 97030, by April 15, 1988.

How The Documents Are Organized

Included in the package are the Draft Environmental Impact Statement (DEIS), Reviewers Guide and Response Form, The Appendices to the DEIS, a packet of maps, and the Proposed Forest Plan for the Mt. Hood National Forest and Appendices.

A brief description of these documents and supporting documents follows:

DEIS:

Chapter I Purpose and Need

Chapter II Alternatives, Including the Proposed Action

Chapter III Affected Environment

Chapter IV Environmental Consequences

Following these chapters are the list of preparers, the list of agencies, organizations and persons to whom the DEIS and Forest Plan were sent, the references cited in the discussions, a Glossary of terms and an Index to the DEIS.

Appendices:

The Appendices for the Draft Environmental Impact Statement are bound in a separate document and accompany the DEIS.

The Proposed Land and Resource Management Plan for the Mt. Hood National Forest:

This plan contains information about how the Mt. Hood National Forest would be managed if the Forest Service's Preferred Alternative (Alternative E) were implemented.

Note: It is important to remember that this proposed Plan is just that, a proposal, and that the Draft Environmental Impact Statement is just that, a draft. The information gained in the public review process can result in a modified, or even a new Preferred Alternative.

Map Package:

The accompanying map package contains maps of land allocations under each alternative, as well as other information pertinent to an understanding of the alternatives.

Reviewers Guide and Response Form:

This contains a brief overview of the DEIS and includes a form to aid you in responding to our proposal.

In addition to the material listed above that is contained in the DEIS, the Management Plan, and the supporting Appendices; process papers and records are on file and readily available at the Mt. Hood national Forest Supervisors Office, 2955 NW Division St, Gresham, Oregon 97030.

DEIS-Table of Contents

Chapter I

A. Introduction	I-1
B. Purpose and Need	I-3
1. Basic Laws and Regulations	I-1
2. Ten Planning Steps	I-2
3. Planning Records	I-3
4. Tiering Environmental Assessments.	I-3
5. Previous Plans	I-3
C. Forest Highlights and Resources	I-4
1. Background.	I-4
2. Social and Economic Aspects	I-4
3. Physical and Biological Features	I-4
4. Resources	I-6
D. Public Issues	I-7
1. The Effects of Public Issues on Forest Planning.	I-7
2. List of Public Issues	I-7
3. Relationships Between Public Issues	I-8
E. Public Issue Groups	I-8
Public Issue Group 1: Timber Supply.	I-8
Public Issue Group 2: Fish Habitat and Water Quality.	I-10
Public Issue Group 3: Old Growth and Wildlife Habitat	I-11
Public Issue Group 4: Outdoor Recreation Resources	I-12
Public Issue Group 5: Unroaded Areas	I-14
Public Issue Group 6: Community Dependence.	I-15
Interrelationships of Public Issue Groups	I-16

Chapter II Alternatives, Including the Proposed Action

A. Introduction	II-1
B. The Formulation of Alternatives	II-1
1. Introduction.	II-1
2. Identify Legal Requirements, Resource Capabilities,	
Resource Use & Development Opportunities and Public Issues	II-2
a. Legal Requirements	II-2
b. Resources Capabilities	II-2
c. Resource Use and Development Opportunities	II-3
d. Management Concerns.	II-3
e. Public Issues.	II-4

3. Collecting Data and Identifying Analysis Areas	II-4
a. Data Collection	II-4
b. Analysis Areas	II-4
4. Identify Management Areas and Develop Management Standards and Resource Management Prescriptions	II-4
a. Management Areas	II-4
b. Management Direction and Prescriptions	II-5
5. Determining the Decision Space and Analyzing Relationships ..	II-5
a. Benchmarks	II-5
b. Decision Space	II-5
c. Minimum Management Requirements	II-7
C. Description of Alternatives	II-10
1. Required Alternatives	II-10
a. Current Direction (No Action)	II-10
b. No Change	II-10
c. Emphasis on the RPA Program	II-10
d. Emphasis on Market Opportunities	II-10
e. Emphasis on Nonmarket Opportunities	II-10
f. Emphasis on Nondevelopment & Intensified Management	II-10
g. Preferred Alternative	II-11
2. Alternatives Evaluated and Eliminated from Detailed Study ..	II-11
a. Benchmarks	II-11
b. Other Alternatives Evaluated and Eliminated	II-12
3. Use of Departures in Alternatives	II-14
4. How Alternative NC Differs From the Others	II-15
a. Alternative (NC) No Change - Legal Perspective	II-15
b. Alternative (NC) No Change - Differences in Data Used ..	II-15
1. Tentatively suitable land	II-16
2. Suitable land	II-16
5. Alternatives Considered in Detail	II-16
a. Alternative NC (No Change)	II-18
b. Alternative A (No Action)	II-18
c. Alternative B (RPA)	II-19
d. Alternative C	II-20
e. Alternative D	II-21
f. Alternative E (Preferred)	II-22
g. Alternative F	II-23
h. Alternative G	II-24
i. Alternative H	II-24
j. Alternative I	II-25
6. Management Areas	II-26

a. Category A.	II-26
b. Category B.	II-27
c. Category C.	II-27
d. Salvaging Mortality (Dead & Dying Trees)	II-27
(1) Salvage Harvest in Category B Areas	II-28
(2) Salvage Harvest in Category C Areas	II-29
e. Management Area Acreages	II-29
f. Synopsis of Objectives, Directions, and Programs	II-29
D. Outputs, Effects, Economics, and Tradeoffs	II-38
1. Public Issue 1: Timber	II-38
a. Outputs.	II-38
b. Comparisons of Past and Projected Timber Outputs	II-40
c. Timber Resource Management Information	II-40
d. The 1980 Forestry Program for Oregon (FPFO)	II-45
e. Range Management	II-47
2. Public Issue 2: Fish Habitat and Water Quality	II-48
3. Public Issue 3: Wildlife Habitat	II-51
4. Public Issue 4: Recreation	II-51
a. Introduction	II-51
b. Developed Recreation	II-52
c. Wilderness Recreation	II-52
d. Dispersed Recreation	II-53
e. Quality of Viewsheds	II-54
5. Public Issue 5: Unroaded Areas	II-54
6. Public Issue 6: Dependent Communities	II-56
a. Introduction	II-56
b. Timber Supply in the Four County Influence Area	II-56
c. Changes in Employment and Receipts to Counties	II-57
d. Minerals Program	II-57
(1) Locatable Minerals	II-57
(2) Mineral Leasing	II-57
(3) Saleable/Common Variety Minerals	II-59
(4) The Dalles Watershed	II-59
e. Range Program	II-59
E. Economic Efficiency Analysis of Alternatives	II-60
1. Introduction	II-60
2. Net Public Benefit	II-60
3. Present Net Value	II-60
4. Priced Outputs	II-60
5. Nonpriced Outputs	II-60
6. Economic Comparisons and Tradeoffs Between Alternatives.	II-61

7. PNV and Discounted Costs and Benefits of Alternatives..	II-61
a. Cost Analysis	II-61
b. Fixed Costs	II-61
c. Total Costs	II-62
d. Cash and Benefit Flows	II-62
8. Major Tradeoffs Among Alternatives.	II-63
National, Regional and Local Overview	II-63
Economic Values and Responses to Public Issues.	II-63
Differences and Similarities of Individual Alternatives.	II-63
Alternative C	II-64
Alternative NC (No Change)	II-65
Alternative D	II-66
Alternative A (No Action)	II-66
Alternative E (Preferred)	II-66
Alternative G	II-67
Alternative B (RPA)	II-67
Alternative F	II-67
Alternative I	II-68
Alternative H.	II-68

Chapter III Affected Environment

A. Introduction	III-1
B. Physical and Biological Environment.	III-1
1. Geologic Setting	III-1
2. Climate	III-3
3. Soil Resources.	III-5
4. Water	III-8
5. Air Quality	III-15
6. Vegetation Zones and Their Plant Communities.	III-16
7. Riparian Areas.	III-19
8. Research Natural Areas (RNAs)	III-20
9. Sensitive Species of Plants	III-23
10. Fish	III-25
11. Wildlife.	III-30
12. Fire	III-35
C. Human Environment.	III-37
1. Communities	III-37
2. Range Management.	III-45
3. Timber Management	III-46
4. Minerals and Energy Resources	III-59
5. Transportation System	III-62
6. Recreation.	III-67

7. Proposed Wild and Scenic Rivers	III-77
8. Wilderness.....	III-79
9. Unroaded Areas.....	III-84
10. Special Interest Areas	III-85
11. Visual Resources Management	III-88
12. Cultural Resource Management.....	III-92
13. Indian Concerns	III-98
14. Land Ownership.....	III-99
15. Special Use Permits	III-101
16. Other Agency Management and Plans	III-102
17. Law Enforcement Program	III-103

Chapter IV - Environmental Consequences of the Alternatives

A. Introduction	IV-1
1. Impacts of the Alternatives' Activities on Specific Resources.....	IV-1
2. Impacts of the Alternative Implementation	IV-1
B. Environmental Consequences Associated With the Alternatives	
1. Physical Consequences	IV-2
Effects of Alternatives Activities on:	
a. Geologic Environments	IV-2
b. Soil Resources	IV-5
c. Air Quality	IV-10
Environmental Consequences of Alternatives Activities on:	
d. Vegetation	IV-13
(1) Factors of Control in Timber Management	IV-13
(2) Direct Effects on Vegetation by Alternative	IV-16
Effects of Alternatives Activities on:	
e. Aquatic Resources	IV-24
f. Fire Management	IV-34
g. Wildlife	IV-37
Effects of Alternatives Activities on the Human Environment	
a. Effects on Communities.....	IV-41
Effects of Alternatives Activities on:	
b. Recreation Opportunities	IV-47
c. Wild and Scenic Rivers	IV-50
d. Wilderness	IV-54
e. Unroaded Areas	IV-56
f. Special Interest Areas	IV-58
g. Visual Resources	IV-60
h. Cultural Resources	IV-70
i. Energy Resources	IV-73

3. Short Term Use And Long Term Productivity	IV-75
a. Timber Production.....	IV-75
b. Soil Productivity	IV-76
4. Irreversible and Irretrievable Commitment of Resources.....	IV-77
a. Irreversible Commitments	IV-77
b. Irretrievable Commitments	IV-77
5. Probable Adverse Environmental Impacts	
That Cannot be Avoided	IV-78
a. Potential Impacts on Forest Resources	IV-78
6. Environmental Conditions	
Which do not Change by Alternative	IV-78
List of Preparers	LP-1
List of Agencies, Organizations and Persons to Whom Copies of the	
Statement were sent.	LA-1
References	R-1
Glossary	G-1
Index	I-1
Appendices (see separate document	
"Appendices-Draft Environmental Impact Statement").	
Appendix A Public Issue, Management Concern, and	
Opportunity Development Process	A-1
Appendix B Description of the Analysis Process	B-1
Appendix C Unroaded Areas	C-1
Appendix D Management Direction not in Preferred Alternative	D-1
Appendix E Wild & Scenic Rivers Eligibility, Classification, Suitability..	E-1
Appendix F Effects of the Regional Draft Spotted Owl Environmental	
Impact Statement on Alternatives Presented in the Mt. Hoods DEIS.	F-1
Appendix G Sensitivity Analysis of Significant Forest Minimum	
Management Requirements	G-1
Appendix H Interpretation of Land Use Plans of Other Agencies within	
the Influence Zone on the Mt. Hood National Forest.	H-1

DEIS-list Of Tables, Graphs & Figures

Chapter I

Maps

Map I-1 Mt. Hood National Forest Location Map	I-5
---	-----

Tables

Table I-1 Status of Existing Plans under The Forest	
Land and Resource Management Plan	I-3
Table I-2 Public Issue Interrelationships	I-16

Chapter II Alternatives, Including the Proposed Action

Figures

Figure II-1 Long Term Sustained Yield (LTSY) (By Alternatives)	II-38
Figure II-2 Timber Sale Program Quantity	II-38
Figure II-3 Allowable Sale Quantity (ASQ)	II-44
Figure II-4 Aquatic Habitat Stability Index	II-48
Figure II-5 Acres Allocated to Riparian Management ...	II-48
Figure II-6 Allocations to Wildlife Management Areas ..	II-50
Figure II-7 Young Growth and Old Growth After 50 Years	II-51
Figure II-8 Supply VS Demand: Developed Recreation	II-52
Figure II-9 Supply VS Demand: Wilderness Recreation	II-52
Figure II-10 Supply of Dispersed, Semi-Primitive Motorized Recreation After 50 Years	II-53
Figure II-11 Supply of Dispersed, Semi-Primitive Non-Motorized Recreation After 50 Years	II-53
Figure II-12 Expected Future Condition of the Forest's Viewsheds.	II-53
Figure II-13 Areas Retaining Unroaded Characteristics	II-54
Figure II-14 First Decade Changes in Employment	II-57
Figure II-15 Payments to Counties, First Decade	II-57

Tables

Table II-1 Resource Use and Development Opportunities	II-3
Table II-2 Management Concerns and Public Issues	II-3
Table II-3 Summary of Benchmark Decision Space	II-6
Table II-4 MMR Effects on the Max PNV Benchmark's Harvests and Economics	II-9
Table II-5 First Decade Departure Volumes ...	II-15
Table II-6 Comparison of the Existing Timber Management Plan to the No Action Alternative.	II-17
Table II-7 Harvest of Dead and Dying Trees in Category B Areas	II-28
Table II-8 Acreage in Management Areas by Alternative.	II-30
Table II-9 Acres Suitable for Timber Production	II-31
Table II-10 Outputs Related to the Timber Supply Question. ...	II-39

Table II-11 Other Outputs Associated with Timber Supply	II-40
Table II-12 Comparison - Past, Present and Alternative Timber Outputs	II-41
Table II-13 Timber Resource Management Information	II-42
Table II-14 The Relationship of the Proposed Action and Alternatives to the Basic Objectives of the Forestry Program for Oregon.	II-46
Table II-15 Ability to Meet Mt. Hood Forest Share of FPFO Target Levels Expressed in Millions of Cubic. Feet Per Year	II-47
Table II-16 Proportion of Potential Timber Land Managed for Full Timber Production	II-47
Table II-17 Outputs Related to the Fish Habitat and Water Quality Issue	II-49
Table II-18 Outputs Related to the Wildlife Habitat Question ...	II-50
Table II-19 Supply VS Demand for Dispersed Recreation	II-53
Table II-20 Expected Visual Condition of the Forest in 50 Years	II-54
Table II-21 Disposition of the Unroaded Areas	II-54
Table II-22 Areas to be Managed to Retain Unroaded Characteristics	II-55
Table II-23 Development of the Unroaded Areas During the Next 10 Years	II-55
Table II-24 Total Projected Harvest in the Forest's Influence Area	II-56
Table II-25 Percent of Locatable Mineral Acres with Moderate Potential in Restricted Areas	II-58
Table II-26 Restrictions on Geothermal Resources	II-59
Table II-27 PNV and Discounted Costs and Benefits	II-61
Table II-28 Discounted Benefits and Costs by Resource Group ...	II-61
Table II-29 Costs for Minimum Level Management	II-62
Table II-30 Average Annual Costs by Alternative for the First Decade	I-62
Table II-31 "Other" Variable Costs	II-62
Table II-32 Average Annual Cash Flows and Noncash Benefits ...	II-63
Table II-33 Indicators of Responsiveness to the Public Issues ..	II-64
Table II-34 Tradeoffs Between Economic Benefits and Responses to Public Issues	II-65

Chapter III Affected Environment

Figures

Figure III-1 Risk Conditions for Landslide Occurrence	III-2
---	-------

Figure III-2 Relative Composition of Total Forest Riparian Area Base	III-19
Figure III-3 Wildlife Habitat Types/Stand Condition	III-30
Figure III-4 Influence Area Harvest	III-44
Figure III-5 Annual Timber Production Mt. Hood National Forest.	III-52
Figure III-6 Mt. Hood National Forest Cut and Sell History	III-52
Figure III-7 Forest Timber Values per Thousand Board Feet	III-54
Figure III-9 Road Density Within Major Watersheds	III-63
Figure III-10a Recreation Use Trends, Mt Hood National Forest	III-68
Figure III-10b Recreation Use Trends Pacific Northwest Region	III-70
Figure III-11 Recreation Opportunity Spectrum	III-71
Figure III-12 Annual Skier Visits	III-74
Maps	
Map III-1 Major Earthflow Areas	III-105
Map III-2 Major Drainages and River Basins	III-9
Map III-3 Municipal and Fish Hatchery Supply Watersheds	III-12
Map III-4 Vegetative Zones	III-18
Map III-5 Research Natural Areas	III-22
Map III-6 Socio-Economic Influence Area	III-38
Map III-7 Working Groups	III-51
Map III-8 Major Recreation Sites	III-69
Map III-9 Wild, Scenic and Recreational River Inventory	III-78
Map III-10 Wilderness and Unroaded Areas	III-80
Map III-11 Special Interest Areas	III-89
Map III-12 Scenic Viewsheds	III-93
Map III-13 Inventoried Visual Quality Objectives	III-94
Tables	
Table III-1 Bodies of Water on the Forest	III-8
Table III-2 Sensitive Plant Species	III-24
Table III-3 Salmonids Found on the Forest	III-26
Table III-4 Habitat Types and Capability Indices	III-26
Table III-5 Annual Average Production of Anadromous Fish from Hatcheries	III-27
Table III-6 Resource Program Activities and Associated Effects on Riparian and Aquatic Habitat	III-28
Table III-7 Habitat Types and Capability Indices with Full Enhancement	III-29
Table III-8 Acres of Wildlife Habitat Types by Age Class	III-30
Table III-9 Summary of Wildlife Use by Stand Condition	III-32
Table III-10 Species Which Use or Require Special Habitats by Type	III-32
Table III-11 Population and Harvest of Big Game	III-33

Table III-12 Proposed Indicator Species for Mt. Hood N.F.	III-33
Table III-13 Wildfire Causes and Acres Burned 1970-1979	III-35
Table III-14 Influence Area Work Force and Income	III-42
Table III-15 Average Payments to Counties, FY 80-84	III-42
Table III-16 Payments to Counties by Management Activities, FY82	III-42
Table III-17 Estimated Employment Derived from National Forest Timber	III-43
Table III-18 1972 Wood Processing Facilities	III-44
Table III-19 1982 Wood Processing Facilities	III-44
Table III-20 Change in Number of Facilities 1972-1982	III-44
Table III-21 1985 Permitted Grazing Use	III-45
Table III-22 Timber Removed from the Mt. Hood Influence Area	III-49
Table III-23 Projected Potential Timber Harvest from Mt. Hood Influence Area	III-49
Table III-24 Amount of Timber Supplied from Forest to Four-County Influence Area to Maintain Supply	III-49
Table III-25 Lands Tentatively Suitable for Timber Production ...	III-50
Table III-26 Timber Volumes by Working Groups	III-50
Table III-27 Tentatively Suitable Timberlands by Age Group	III-50
Table III-28 Volume of Mt. Hood Timber Processed in Nearby Mills .	III-53
Table III-29 Total Homes Heated, and Heated by Wood Only ...	III-53
Table III-30 Known Geothermal Resource Areas (KGRA's) on Forest	III-60
Table III-31 Recreation Visitor Days in FY 86	III-68
Table III-32 Existing ROS Condition of the Forest	III-71
Table III-33 Ability to Meet Recreation Demand in RVD's Per Year .	III-72
Table III-34 Current Use of Developed Sites by ROS Class	III-74
Table III-35 Projected Recreation Demand Outlook for Developed Sites in Recreation Visitor Days per Year	III-74
Table III-36 Forest Recreation Trail Mileages by Ranger District ..	III-75
Table III-37 Estimated Future ORV Demand in RVD's Per Year ..	III-76
Table III-38 Wilderness Recreation Demand in RVD's Per Year ...	III-83
Table III-39 Most Heavily Used Wilderness Destinations	III-83
Table III-40 Existing WROS Classification Zones in Acres	III-84
Table III-41 Roadless Areas, Wilderness and Remaining Acres ..	III-84
Table III-42 Unroaded Areas by Ranger Districts	III-85
Table III-43 Variety Class Inventory	III-90
Table III-44 Visual Sensitivity Levels	III-91
Table III-45 Visual Distance Zones	III-91
Table III-46 Existing Visual Condition	III-91
Table III-47 Recommended Visual-Quality Levels	III-92

Table III-48 Habitats of Plants Gathered by Native Americans	III-99
Table III-49 Land Ownership Groups	III-100
Table III-50 Land Ownership Planning.	III-101
Table III-51 Land Acquired Under the Plan	III-101
Table III-52 Special Use Permits	III-101

Chapter IV Environmental Consequences Of The Alternatives

Figures

Figure IV-1 Water Yield as a Percent of Total Yield	IV-4
Figure IV-2 Expected Production of Total Suspended Particulates from Prescribed Burning	IV-10
Figure IV-3 Expected Percent Reduction in Total Suspended Particulates from Baseline	IV-12
Figure IV-4 Acres Available for Timber Harvest (by Alternative)	IV-13
Figure IV-5 Timber Harvest Prescriptions (by Alternative)	IV-13
Figure IV-6 Acres Planned	IV-14
Figure IV-7 Precommercial Thinning	IV-14
Figure IV-8 Commercial Thinning	IV-14
Figure IV-9 Fertilization	IV-14
Figure IV-10 Percent of Old Growth Remaining	IV-21
Figure IV-11 First Decade Employment Changes	IV-41
Figure IV-12 First Decade Income Changes	IV-42
Figure IV-13 First Decade Payments to Counties	IV-42
Figure IV-14 Dispersed Recreation Opportunity Spectrum	IV-49
Figure IV-15 Viewshed Conditions	IV-61

Tables

Table IV-1 Expected Number of Acres Where Prescribed Fire is Used for Fuel Treatment and Site Preparation	IV-11
Table IV-2 Timber Stages by Age Class	IV-15
Table IV-3 Aquatic Effects by Alternative	IV-25
Table IV-4 Relative Risk Ratings for Cumulative Effects upon Water Quality and Fish Habitat	IV-30
Table IV-5 Measures Commonly Applied During Project Planning and Implementation to Mitigate Riparian Area Effects ...	IV-32
Table IV-6 Measures Commonly Used to Rehabilitate Riparian or Aquatic Resources	IV-32
Table IV-7 Expected Number of Industrial-Caused Fires	IV-36
Table IV-8 Fuel Treatments Per Decade by Alternative	IV-36
Table IV-8a Expected Number of Wildfires Greater Than One Year ..	IV-36
Table IV-9 Expected Fire Suppression Costs by Alternative	IV-37
Table IV-10 Percent of Demand Supplied in Year 2030 by Type of Opportunity	IV-48

Table IV-11 Dispersed ROS Acres by Year 2030	IV-48
Table IV-12 First Decade Timber Harvest in the Columbia Gorge National Scenic Area.	IV-60
Table IV-13 Visual Condition of Viewsheds	IV-63
Table IV-14 Inventory of Acres and Number of Viewsheds by Levels of Sensitivity	IV-66
Table IV-15 Expected Visual Condition by Alternatives and by Percent of Forest.	IV-67
Table IV-16 Energy Balances by Resource Group and Alternative	IV-74
Table IV-17 Short Term Effects of Departure Alternatives	IV-75
Table IV-18 Short Term Versus Long Term Harvest	IV-76

DEIS-SUMMARY

A. Introduction

1. Purpose of the Draft Environmental Impact Statement and Proposed Forest Plan

The National Forest Management Act of 1976 (NFMA) requires preparation of a plan for the management of each national forest. When adopted, the Forest Land and Resource Management Plan (Forest Plan for short) will establish management standards to guide all resource management activities. The annual Mt. Hood National Forest program planning process and the approved Forest Plan's schedules and costs will assist in forming an annual program budget. The annual program budget will be the basis for funding the activities in the Forest Plan.

The proposed Forest Plan for the Mt. Hood National Forest (the Forest) is contained in a separate document, which is available for public review and comment.

The Draft Environmental Impact Statement (DEIS) has been prepared in accordance with the requirements of the National Environmental Policy Act of 1969, and regulations issued by the Council of Environmental Quality. The DEIS describes ten alternative plans for the future management of the Forest, along with the effects of managing the Forest under each plan. It discusses the goods, services and benefits provided by each alternative, and the costs and environmental consequences resulting from them. The alternative plan identified in the DEIS as the preferred alternative is the basis for the proposed Forest Plan.

This proposed Forest Plan and alternatives to it are being presented to the public in draft form, in order to solicit comments and suggestions on how the Forest Plan could be improved. It is expected that modifications of the Forest Plan will result from public review. Other changes in the Forest Plan may be necessary because of new information. Two possible sources of such information are the Supplement to the Regional Guide for the Pacific Northwest Region that will guide management of spotted owl habitat, and an assessment of timber supply for the Region. All modifications will be explained in the Final Environmental Impact Statement (FEIS) and Forest Plan. NFMA Regulations provide for modifying

the Forest Plan after implementation has begun. Amendments to the Forest Plan may be made at any time, after notifying the public. If an amendment will produce a significant change in the Forest Plan, or if the Secretary of Agriculture finds that conditions have significantly changed, the Forest Plan will be revised and public participation will be solicited. The Forest Plan will be revised at least every 15 years.

This Summary of the DEIS describes the major areas of controversy identified during formulation of the Forest Plan, and the design of alternatives and results of this analysis, including the main tradeoffs that need to be weighed among the alternatives and public issues. It is intended as an introduction to the complete DEIS, and addresses each of the major sections of this document. Although the Summary is organized somewhat differently than the DEIS, it references the corresponding sections where the reader may find more detailed information.

2. The Affected Environment

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

A full account of the Forest's environmental components is provided in Chapter III of the DEIS. Plans for uses of the Forest have been developed against a backdrop of its environment. This environment provides opportunities, and imposes limitations as well. Those elements of the Forest's affected environment which strongly influence opportunities and limitations are introduced in this Summary.

The Forest straddles the Cascade Mountain Range and includes the moist western slopes and the drier east side. The elevation of the Forest ranges from 65 feet above sea level on the Columbia River to the summit of Mount

Hood, 11,235 feet high. A diverse environment results from the influences of climate and elevation. The Forest's most widespread resource component is its large volume of standing timber that grows on the productive forest lands. These stands contribute raw materials to the forest products industry and provide habitat required by wildlife species. The forested mountains are also an extremely important source of water for use by fish and wildlife, and for human consumption.

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

3. Public Issues

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

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

Fifteen individual issues were identified through the process described above, and are described in detail in Appendix A of this DEIS. Even a casual glance at the Public Issues listed in Appendix A and in Chapter I of the DEIS, shows the virtual impossibility of dealing with them as separate issues. Most of the issues are related to some degree, and since management activities that affect one resource will usually affect a number of other resources, we have grouped those most closely related.

These groups of Public Issues are arranged so they can be logically addressed by the alternatives. As the emphasis of an alternative differs, a given group of issues are addressed in different ways.

Public Issue Groups

Following is a discussion of each of these Public Issue groups. The public's viewpoint or reason for each issue group is presented.

Groups Of Public Issues

1. Level of timber supply and wood fiber production.
2. Maintenance and enhancement of fish habitat and water quality.
3. Maintenance and enhancement of the quality and quantity of old growth and other suitable wildlife habitat.
4. Maintenance and enhancement of wilderness, outdoor recreation resources and scenic quality of the Forest in response to the needs of an increasing nearby metropolitan population.
5. Disposition of the remaining unroaded areas.
6. Community dependance on forest resources.

Public Issue Group 1 : Level of Timber Supply and Wood Fiber Production

Between now and the year 2010, the supply of timber from private lands is expected to decline. The State of Oregon and the Northwest Timber Association feel that the Mt. Hood National Forest should help fill the supply gap until the private lands reach rotation age. The State's "Forestry Program for Oregon" calls for the Forest to produce 111.3 million cubic feet/year (approximately 565 million board feet).

The Oregon Wilderness Coalition has strongly stated their stand that, "the National Forests were not reserved to bail out the private timber companies after they have overcut their own lands". The Coalition is also asking for higher management standards on what is classified as suitable timber growing land base.

The Industrial Forestry Association has taken the stand that the goal of the Forest's timber harvest schedule should be to meet the Nation's rising demand for wood products, and to minimize the inflationary impacts of rising wood prices. A major concern of this association is having a consistent supply of timber.

The Northwest Timber Association (including the Industrial Forestry Association) has identified timber supply as the most important single issue in western Oregon. A major issue with this organization is that managing the Forest for resources other than timber could reduce

wood fiber production to the point that the forest products industry and community stability would suffer. As a result, this organization's representatives insist on the highest possible level of timber production from the Mt. Hood National Forest.

This issue has also been raised by environmental groups, such as Oregon Wilderness Coalition, Northwest Coalition for Alternatives to Pesticides, the Oregon Environmental Council and the Audubon Society, and individuals concerned about health and ecological effects that could result from the use of chemicals, including fertilizers, pesticides and herbicides, in the Forest environment for "brush" and forest pest control.

The Mt. Hood Forest Study Group and the Oregon Department of Fish and Wildlife are concerned that timber harvesting in and near riparian areas will adversely affect wildlife and recreation values, lake productivity, stream bank stability, fish production and water quality.

The Oregon Department of Fish and Wildlife has stated that the Forest should constrain timber harvest, or withdraw from timber harvest and grazing, sufficient riparian habitat to maintain or improve water quality and fish and wildlife habitat values. The Department has raised an issue about scheduling of timber harvest programs, particularly about the rate and extent to which stands of mature and old growth forests are converted to younger age stands. The issue is about the maintenance of necessary habitat conditions and proper cover/forage ratios for wildlife, including non-game species.

The National Wildlife Federation feels strongly that intensive timber practices impair the Forest's wildlife habitat. The Federation, as well as Cascade Holistic Economic Consultants (CHEC), have raised the issue that the Forest should not be investing taxpayers' dollars in timber management where the benefits do not outweigh the costs. Several environmental groups have made an issue about "below cost sales" and "deficit sales" and are concerned that these type of sales are subsidizing the timber industry.

The Oregon Wilderness Coalition has raised an issue about the disparity of trail miles compared to road miles on the National Forests, and are asking that the Forest Service consider a multitude of road standards based on costs and purposes for roads. They are also asking for consideration of road closures and road rehabilitation to benefit soil, water, fish, wildlife and recreation.

The Oregon Environmental Council has often made an issue of undesirable cumulative effects of road building and use of tracked or wheeled vehicles on the Forest on land stability, harmful land movements and erosion.

The Northwest Office of the Sierra Club and the Mt. Hood Forest Study Group have urged that the many values of roadless areas be recognized and that areas be maintained. These groups have also stated they believe that the tree improvement program would be strengthened by the preservation of natural gene pools within Wilderness.

Public Issue Group 2: Maintenance and Enhancement of Fish Habitat and Water Quality

Environmental groups have raised the issue that chemicals used in the management of Forest vegetation may enter streams, lakes, and other riparian areas and adversely affect water quality and aquatic habitat.

The Oregon Wilderness Coalition has stated that the Forest Service should make maintenance of existing fish habitat and restoration of lost fish habitat top priorities. They also consider the management of resident fish habitat and riparian zone management to be an issue. This group believes that nonstatutory municipal watersheds on the Forest should not have programmed timber cutting and that protection of the water supply should be the dominant use of the allowed multiple uses.

Preservation of water quality is an important issue for many residents near the Forest, as well as many of those who use the Forest for recreation or irrigation. A very large number of people depend on water flowing from the Forest's watersheds. The Columbia River Inter-Tribal Fish Commission has a great interest in preserving water quality and watershed stability.

The Mt. Hood Forest Study Group and the Mazamas have raised the issue that riparian areas need protection from timber harvest, road building and other intrusions in order to preserve wildlife values, protect stream bank stability and insure fish production.

Timber industry interests view the timber growing within riparian areas as an important part of the timber supply and generally oppose restricted timber harvest within riparian areas.

The Northwest Office and the Columbia Group of the Sierra Club and the Mt. Hood Forest Study Group have identified protection and enhancement of fish habitat and fish production as one of their major issues on the Forest. The Columbia River Inter-Tribal Fish Commission and the Sierra Club have stated that they believe the Forest Service has statutory obligations to maintain and to enhance anadromous fish populations and that fish production targets for natural resident and anadromous fish should be established and that habitat goals should be based on these targets.

The Mt. Hood Forest Study Group and the Oregon Department of Fish and Wildlife have raised the issue

that road building resulting from timber harvesting in and near riparian areas will restrict fish passage and impact riparian areas.

Demands for maintenance and enhancement of fish habitat and water quality have steadily increased in the last decade. In addition to State legislation, recent Federal legislation, such as the Northwest Power Planning and Conservation Act, has called for increased protection of water from competing uses like hydropower development, forest management activities, and agricultural practices.

The regional demand for anadromous fish far exceeds the current supply. As a consequence, a major issue with the Oregon Department of Fish and Wildlife and the Columbia River Inter-Tribal Fish Commission concerns methods to increase anadromous fish production, especially the anadromous stocks of the Columbia River Basin.

The Sierra Club and the Oregon Department of Fish and Wildlife state that, notwithstanding the current dams in place, the level of production of the Mt. Hood National Forest fishery for salmon and steelhead is substantially below potential. They have stated that the production levels of the Forest fishery being below potential is an important issue. These groups and Trout Unlimited, as well as many individuals, feel the Forest should increase and enhance fish habitat, including habitat for wild trout, in order to achieve substantial increases in the production of fish.

Public Issue Group 3: Maintenance and Enhancement of the Quality and Quantity of Old Growth and Other Suitable Wildlife Habitat

The Oregon Wilderness Coalition has raised as an issue the need to resolve the continuing loss of wildlife habitat due to range and timber management activities. At issue is the amount and management of habitat for sensitive animal and plant species, identified "indicator species", and any potentially threatened or endangered species. The Coalition has urged the Forest Service to recognize "diminishing species" and to develop better inventories of wildlife species, as is done for timber.

The Mazamas have stated that they support multiple use of the Forest with a balance between the many users. However, they have stated that timber is the biggest area of conflict. The issue is that some of the highly productive timber sites need to be preserved to provide suitable habitat for dependent plants and animals. Consideration for both game and nongame wildlife is also an issue with this organization. The Sierra Club insists that the Forest must be managed in compliance with laws and regulations which require it to provide adequate habitat to

maintain viable populations of wildlife. The issue is the sharp difference in opinion on how much habitat should be allocated to maintain viable populations of wildlife. Environmental groups such as the Audubon Society feel that considerably more acres of habitat are necessary than do timber industry groups such as the Northwest Timber Association and the Associated Oregon Loggers, Inc.

The National Wildlife Federation feels that increased roading will increase harassment of wildlife and impair wildlife movement.

Sporting groups feel that a high density of roads may adversely affect hunting quality. These groups have also voiced as an issue the need for road closures and construction of fewer roads.

Some environmental groups believe old growth forests are rapidly declining. They believe old growth forests are needed in sufficient size and distribution to sustain viable populations of dependent plants and animals. Other groups such as the Audubon Society are discussing the importance of old growth as ecological communities for many species.

The Associated Oregon Loggers, Inc. and other timber industry groups are not willing to accept reductions in timber output caused by retaining lands in timber as wildlife habitat. This applies especially to stands of "old growth."

Some environmental groups, such as Earth First!, Cathedral Forest Action Group, and many individuals highly value wildlife found in old growth forests. The issue is that, with continued timber harvesting these values will be lost.

The Oregon Department of Fish and Wildlife has raised the issue that the Forest must protect habitat in compliance with the Interagency Spotted Owl Management Plan and insure adequate monitoring of owl habitat.

The Audubon Society has an issue over whether or not sufficient areas of appropriate wildlife habitat are being provided on the Forest, and are questioning what is a minimum viable population.

The Oregon Wilderness Coalition has raised ecological diversity on the National Forest System as an issue and a requirement of law. The Oregon Department of Fish and Wildlife (ODFW) is also concerned about habitat diversity on the Forest needed to meet ODFW objectives for all species of wildlife. This issue is related to the public issue dealing with riparian-dependent resources because wildlife and riparian areas often overlap.

Cascade Holistic Economic Consultants (CHEC) has raised the issue that the Forest Service must maintain diversity of plant and animal communities and tree species similar to natural diversity in all parts of the

Forest, and that management must change if natural diversity is not maintained. Also, the Service must maintain existing natural plant communities and successional stages by allocating land specifically for the purpose of maintaining diversity.

The Northwest Office of the Sierra Club and the Mt. Hood Forest Study Group have raised the issue that the maintenance of the present scenic, special interest, and roadless areas of the Forest in a natural state is essential to enhancing habitat of sensitive plant and wildlife species. They also believe the areas are essential for the eventual perpetuation of wildlife populations. They think the tree improvement program would be strengthened by the preservation of natural gene pools within Wilderness and natural areas.

The Mt. Hood Forest Study Group urges that old growth areas be maintained to aid in maintaining riparian habitat.

Public Issue Group 4: Maintenance and Enhancement of Wilderness, Wild and Scenic Rivers, Outdoor Recreation Resources and Scenic Quality of the Forest in Response to the Needs of an Increasing Nearby Metropolitan Population

The issue with the members of the Oregon Environmental Council is that the amount of Forest land removed from the timber base for unroaded recreation and scenic quality is insufficient.

An issue with the Northwest Timber Association is how much timber will be available for harvest after meeting recreation concerns.

Closing spur roads after logging and having more main line roads paved are issues with the Mazamas.

Environmental and outdoor groups have raised an issue that the Forest transportation system provide recreational parking at road junctions, or other areas where there is winter use or trail parking needs.

This issue is directly related to the problem of especially severe congestion on U.S. Highway 26 during the winter skiing season. This issue was brought out and extensively discussed in a study of the situation conducted jointly by the Forest Service, the Oregon Dept. of Transportation, and the Federal Highway Administration. The study disclosed that the use of Highway 26 often exceeded its capacity during the ski season, creating especially severe congestion on U.S. Highway 26. Expansion of existing ski resorts or other winter recreation facilities under Forest Service Administration could make this problem worse if management of winter sports is not coordinated with steps to reduce the congestion.

Environmental groups, such as Earth First! and Cathedral Forest Action Group and numerous individuals highly value the recreational, scenic and aesthetic values found in old growth forests. The issue is that with continued timber harvesting these opportunities will be lost. These groups insist that old growth forests are highly desirable for recreation, tourism, scenery and other aesthetic values.

The Mazamas have stated that the issue is that harvesting needs to be based on the economically allowable harvest base, and that some of the Forest land base needs to be placed in recreational, scenic, roadless, Wild Rivers, and Wilderness classifications.

The amount of Forest land that is removed from the commercial timber base for unroaded recreation and scenic quality is insufficient, according to an issue expressed by members of the Oregon Environmental Council. Associated issues expressed by the Council are the loss of scenic quality in a number of travel corridors from timber cutting treatments, harvest levels, and cutting practices in riparian areas.

The Northwest Office of the Sierra Club and the Mt. Hood Forest Study Group have stated that they believe the maintenance of the present scenic, special interest, and roadless areas of the Forest in a natural state is essential to continuation of diverse recreation opportunities on the Forest. The Oregon Wilderness Coalition has restated that the Wilderness issue is still an issue with their group and have urged the designation of additional special interest areas.

Conflicts between the various types of winter users are increasing. The Nordic Ski Club and other ski groups and individuals do not favor the use of roads in winter snow zones by four wheel drive enthusiasts. At issue with these groups is that available winter parking and trails for cross country skiing do not meet the current needs, and are overcrowded most winter days. These groups are asking for more winter parking, more winter trails and adequate administration of winter recreation use.

The American Motorcyclist Association has gone on record requesting Forest Service support for providing opportunities for their 130,000 active members to use motorcycles on Forest land. They have stated that "correct management" is taking into account the nature and effects of motorcycle use, and taking the minimum steps necessary to halt adverse effects on the land.

Prior to the 1960's, the Forest had an extensive network of trails. At issue with the Mazamas, the State of Oregon, the Obsidians and other hiking groups and individuals is that they would like to see more emphasis placed on restoring trails lost through timber harvesting and road building. They have also made an issue of the fact that the remaining trail system is concentrated in ex-

isting scenic areas, or Wildernesses, and that many remaining trails are deteriorating due to heavy use and lack of maintenance.

The Oregon Wilderness Coalition has raised the management and disposition of recreation trails on the Forest as an issue of concern to them and has urged the Forest Service to coordinate Forest Service trail system plans with the State's trail system plans.

The Audubon Society has requested that the Forest protect major road corridors, scenic and recreational areas from the "visual blight" of clearcuts.

The Sierra Club and the Mt. Hood Forest Study Group have stated their belief that the Forest should be managed for the best uses of its diverse recreation resources, and that the need to maintain the land's natural beauty cannot be neglected. The Oregon Environmental Council has described as an issue with the effect of management activities on scenic quality in travel corridors and other scenic areas of the Forest. At issue are management activities, including timber harvest, which affect scenic values, because much of the Forest is clearly visible from the various roads and highway loops traversing the Forest.

The Oregon Wilderness Coalition has urged the inclusion of Forest rivers into the Wild and Scenic Rivers Systems.

Members of the timber industry, such as Northwest Timber Association, have stated an issue about how much timber will be available for harvest after meeting visual quality objectives.

Available studies suggest that skiing terrain within existing ski areas will be developed beyond the capacity of the area to accommodate the activity. An issue is that the Northwest Ski Association, especially the Mt. Hood Meadows ski resort, is "extremely concerned" about restrictions that may apply to lands adjacent to permit boundaries.

At issue with the Sierra Club, the Oregon Environmental Council, and the Friends of the Earth is that ski area developments will cause urbanization of the Mt. Hood Area.

The Oregon Nordic Club and other cross country skiing enthusiasts are actively seeking the Forest's aid in developing expansion of cross country ski opportunities, including areas, trails and maintained winter parking, to disperse skiers and avoid congestion. Other groups and individuals have made an issue about the impacts from ski area development on unique sites such as Timberline Lodge and Cloud Cap Inn.

The issue with the Mt. Hood Forest Study Group is that maintenance of the present roadless areas in a natural

state is essential to continuation of diverse recreation opportunities.

The close proximity of the Forest to the Portland Metropolitan Area has created a strong demand for outdoor recreation from individuals and organized groups. They have repeatedly voiced the issue that the Forest plays an important role in the leisure activities of Portland residents, and has given them a special sense of ownership.

The Northwest River Defense League and the Sierra Club have stated they would like the Clackamas, Salmon, and White Rivers designated under the Wild and Scenic Rivers Act. The Association of American Steelheaders and the East Multnomah County Soil and Water Conservation District have recommended the Forest Service consider recommending the Salmon River under the Wild and Scenic Rivers Act to protect its water quality and fish habitat.

Public Issue Group 5: Disposition of the Remaining Unroaded Areas

The Oregon Wilderness Act of 1984 left the Forest with approximately 130 thousand unroaded acres in 10 different areas. The Act released these areas to be managed for uses other than Wilderness. Congress intended to settle the Wilderness issue with the release language in the Act. However, the issue raised is a reaction to the Act. It became an issue of whether or not these remaining acres should be kept unroaded.

Members of the Sierra Club have indicated their issue is keeping the unroaded areas in a natural state. Timber industry representatives, however, feel that the Wilderness Act released these lands for timber production and every opportunity to increase harvest levels by roading and harvesting in these remaining unroaded areas should be explored.

The Northwest Office of the Sierra Club, the Federation of Western Outdoor Clubs, and the Mt. Hood Forest Study Group have urged that the values of roadless areas be recognized and that the areas be maintained. They believe maintenance of these areas in a natural state is essential to maintaining diversity of the Forest's ecosystems, enhancing habitat of sensitive plant and animal species, preservation of water quality, continuation of diverse recreation opportunities and perpetuation of wildlife populations. They have also stated they believe that the tree improvement program would be strengthened by the preservation of natural gene pools within Wilderness.

Earth First! has stated it is opposed to any development, such as road building or timber harvest, in the existing roadless areas. They believe the California RARE II lawsuit applies to the entire National Forest System and

maintain that development activities in RARE II areas are illegal until adequate site-specific EIS's are done.

The issue of the Northwest Timber Association is about the amount of Forest land remaining available for timber harvest. Timber industry representatives feel that areas not already designated as Wilderness should be developed as soon as possible for timber production. They feel the issue of timber harvesting on remaining roadless areas was resolved by the Wilderness Act, and the Forest should consider the roadless lands for multiple uses other than Wilderness or unroaded amenity benefits.

The State of Oregon has made an issue of the reduction of the timber base and harvest level. The State is concerned about its economic livelihood, but is also concerned about preserving its environmental and scenic heritage.

Public Issue Group 6: Community Dependence on Forest Resources

The Associated Oregon Loggers have taken the stand that the goal of the Mt. Hood National Forest's timber harvest schedule should be to contribute to the economic well-being of communities dependent on the timber industry.

The Northwest Timber Association has repeatedly emphasized the importance of timber production in relation to community stability. Timber supply to meet the local demand and needs of local industry that purchases timber from the Forest is an issue with them.

Hoodland and Hood River Chambers of Commerce have raised the issue that ski area development is vital to their communities' stability.

Local and Federal government agencies, such as the Parkdale Fire Department, the Oregon Department of Fish and Wildlife, and the Department of Interior have raised the issue that the demands on water supplies and sewage treatment needs resulting from development of more ski area facilities within the Forest will place demands on them that they cannot meet.

Ski area developers of Mirror Mountain and Timberline, and landowners along the Highway 26 corridor have expressed the issue that timber harvesting will damage their recreation-oriented businesses, as well as the property and scenic values of the area. Local residences have raised the issue that, as the Highway 26 corridor population and ski area development increase, the conflicts associated with the interactions between public and private land ownership may be expected to continue. Their issue is that timber management will have adverse effects on local communities that depend on recreating visitors for their livelihoods.

A major issue and concern of communities is that one of the most important economic factors of Forest Service management, the payments to counties in lieu of taxes and the payments from commodity receipts, continue at current or higher levels.

The Hoodland Chamber of Commerce has raised the issue that the economic lifeblood of their communities are dependent on the public that comes to the Forest to recreate and enjoy the scenery. The issue is that proper Forest management of recreation must be forthcoming to deal with future traffic and parking problems that will result from recreation use.

Native Americans on the Warm Springs Reservation have voiced an issue about a possible decrease in the availability of forest products they use in religious and cultural ceremonies. These Native Americans rely on the Forest for fish, wildlife, and plants required for the sustenance of their craft activities, as well as their traditional practices.

4. Resolving the Public Issues

The Public Issues suggest conflicting demands for the Forest's limited resources and the possibility of a wide range of management responses. These conflicts may be addressed by adopting standards and guidelines, designating lands to be managed for particular uses, and by scheduling activities or by investing public funds.

Public Issue groups were converted to goals and objectives for alternatives, as described in Chapter II of the DEIS. For each issue group there is at least one alternative that provides a strong response. Since goals that respond to one issue group are sometimes incompatible with goals for another issue group, there are alternatives which place a low emphasis on responding to some issue groups. Other alternatives provide for mixes of management activities that moderately address most or all of the issue groups.

This introduction has drawn on information contained in Chapters I and III of the DEIS. The next section is a summary of the design of the alternatives development process, descriptions of alternatives, and management area descriptions and prescriptions. Following that are alternative comparisons. The Public Issue groups provide a tool for comparing management alternatives. Chapter II of the DEIS presents tabular comparisons of many outputs and effects that result from managing the Forest under the different alternatives. For review purposes, two or three outputs or effects have been selected to indicate the responsiveness of each alternative to each issue group. These "indicators of responsiveness" are used to compare alternatives in the section on alternative comparison. They are followed by a brief overview of environmental consequences.

B. Alternatives

1. Alternative Development Process

Each alternative considered for the management of the Mt. Hood National Forest defines different levels and mixes of resource outputs in response to Public Issues. The alternatives respond also to related differences in the distribution of land uses, forest management activities, schedules and costs, with accompanying direction and standards. Alternatives reflect the resource capabilities (including both the potentials and the limitations) of the different kinds of lands found on the Forest. These capabilities were analyzed prior to developing alternatives as part of the preliminary planning step called the Analysis of the Management Situation. The results of this analysis were published as a separate document in 1985, and are summarized in Chapter 2 of the Forest Plan. This analysis defined a "decision space" which contained achievable objectives, and framed the choices available for management alternatives.

Each alternative was designed to achieve a range of selected goals and objectives. Some of these objectives, such as meeting legal standards for timber harvest, wildlife habitat, and air and water quality, are common to all alternatives (except Alternative NC, described below). Of these common objectives, some are expected to limit resource development opportunities. These include size and distribution of timber harvest units, and provision of habitat for wildlife species that depend upon mature or old growth forests or riparian areas. These are called minimum management requirements (MMRs).

Other objectives vary among the alternatives and determine the mix and amount of resource outputs. Some objectives can be achieved only at the expense of others, and thus the objectives may also become constraints upon the attainment of other objectives. The varied objectives and responses to the issues can be achieved by managing the Forest lands and resources in different ways that provide different combinations of public benefits for each alternative.

2. Descriptions of the Alternatives

The alternatives presented in the DEIS do not represent every possible option. They do present the decision maker with a broad range of choices.

They also serve to demonstrate the tradeoffs that must be made in responding effectively to all the issues and selecting one alternative that, at the same time, most closely maximized net public benefits.

The theme of each of the alternatives was based on Public Issues and is described here in terms of its goals and objectives. These themes provided the guidelines for development of the alternatives.

Alternative NC (No Change)

The No Change alternative is developed in response to decisions made regarding an appeal brought by the Northwest Forest Resource Council. It represents the existing Timber Management Plan (TM Plan), and consequently does not comply with all provisions of the National Forest Management Act (NFMA) and regulations promulgated by the Secretary of Agriculture. Current management is interpreted as the combination of existing Unit Plans and district Multiple Use Plans for specific areas of the Forest, and individual resource plans, including the Timber Management Plan. Current plans do not specifically recognize the requirements to maintain viable populations of animals or the management of more than 4,700 acres for fish habitat and water quality purposes. Because this alternative does not reflect NFMA's timber land suitability criteria, it devotes more land to timber harvest than any other alternative, including land currently considered unsuitable for timber production. This alternative does not reflect changes in Public Issues and management concerns that have surfaced since the existing plans were developed; however, it permits a variety of existing uses to continue. In accordance with the existing TM Plan, annual harvest will be 356 million board feet.

Alternative A (No Action)

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

Differences in Data Used between Alternatives NC and A

NOTE: In the following discussion various terms, such as "unregulated," appear within quotation marks. These terms were applicable ten years ago when the existing Timber Management Plan was implemented and are defined in the Final Environmental Impact Statement for the Timber Management Plan of the Mt. Hood National Forest, document USDA-FS-R6-FES(Adm)-76-14. These terms are no longer used and do not appear in the glossary of this DEIS.

Tentatively suitable land

A new study of acres tentatively suitable for timber production was completed in July 1984. The study resulted in the finding that 647,000 acres are tentatively suitable for timber production. This is the tentatively suitable land base for all alternatives (including the No Action alternative, Alternative A), except for Alternative NC, presented in this DEIS.

The definition of "commercial forest land" is roughly equivalent to tentatively suitable land. Therefore, the 753,000 acre land base for Alternative NC roughly corresponds to the 647,000 tentatively suitable acres used as the starting land base for development of all the other alternatives addressed in this DEIS. The reasons for the 106,000 acre difference between the "commercial forest land" base used for the Alternative NC and the "tentatively suitable" base used for the other alternatives are explained below. This difference largely accounts for the inability of Alternative A (No Action) or any other alternative to produce sustained levels of timber equal to that of the existing Timber Management Plan as adjusted to date; i.e., Alternative NC.

The following are some of the reasons why the 1984 land classification study found these "commercial forest land" acres to now be unsuitable for timber production: (1) The 1984 study used more specific methods for mapping and determining soil characteristics and capabilities. The Timber Management Plan process used a plot-sample inventory whereas the current study used an in-place data base using recent Soil Resource Inventory, stand examinations, and geological information. (2) This site specific information was further verified with ground checks by Ranger District personnel and members of the ID Team. (3) NFMA and the resulting regulations clarified the need to (a) assure regeneration within 5 years and (b) protect the land from irreversible damage. Since records do not exist regarding the specific location of unsuitable acres relative to the Timber Management Plan, only inferences can be made as to the nature of the 106,000 acre difference.

About 28,000 acres are now considered unsuitable because regeneration is not assured; another 28,000 acres are now considered unsuitable because of the potential of irreversible resource damage. The remaining 50,000 acre difference is assumed to relate to differences in processes and definitions.

Suitable land

The existing Timber Management Plan was initially implemented in 1977. It recognized 824,000 acres of "stand-ard," "special," "marginal" and "unregulated" "commercial forest land." The "unregulated" component comprised 71,000 acres, most of which eventually became Wilderness, unsuitable under current definitions. The remaining 753,000 acres were in the regulated base as of 1977, resulting in a total potential yield of 387 MMBF/yr (assuming no chargeable harvest from the Bull Run, even though acres for this area were included in the 753,000 figure). Since 1977, the Timber Management Plan has been adjusted with respect to the Bull Run (Public Law 95-200), officially approved Unit Plans, and the 1984 Oregon Wilderness Act. This has resulted in an available commercial land base of 656,000 acres and an equivalent ASQ of 356 MMBF/year. Table S-1 summarizes the preceding discussion.

As discussed earlier, the timber suitability study underlying Alternatives A thru I, leading to the 647,000 acre land base determination, was based on more specific and accurate methods than those which underlie Alternative NC's land base of 753,000 acres. The difference of 106,000 acres is the main reason why the harvest drops 32 percent, 356 to 243 MMBF, between Alternatives NC and A, even though both have the same land allocations aside from MMRs. This is confirmed by other statistics. The difference in the inventories of trees in Alternative NC (3860 MMCF) and Alternative A (2867 MMCF) is 26 percent. The difference in the alternatives' respective LTSYCs (65.1 MMCF versus 46.9 MMCF) is 28 percent. The difference in tentatively suitable acres, therefore, is also the reason for the differences in inventories and long-term sustained yield capacities.

Alternative B (RPA)

Alternative B is designed to respond to RPA objectives, and responds most strongly to the public issue of timber supply. Under this alternative, the Forest would be managed to meet a timber production goal of 376 million board feet net merchantable timber per year. This alternative departs from nondeclining flow of timber and harvests more than its long-term sustained yield capacity to provide this timber supply for the 50-year RPA planning horizon.

Table S-1
Comparison of the Existing Timber Management Plan (Alternative NC) to the
No Action Alternative's (Alternative A's) Suitable Base and Harvest

	ALTERNATIVE NC		ALTERNATIVE A	
	M ACRES	MMBF/YR	M ACRES	MMBF/YR
Total National Forest acres	1059		1059	
Unsuitable for timber management	-235		-412	
Tentatively suitable acres	824	500	647	348
Unregulated acres as of 1977 (includes then existing unit plans)	-71			
Subtotal	753	442 ^{1/}	647	348
Minimum Management Requirements			-39	
Bull Run	-68		-46	
Unit Plans ^{2/}	-29		-37	
Land base under Current Direction	656	384	525	243
Adjustment to TM Plan reflect management intensity		-23		
Reduction in salvage volume included in the TM Potential Yield, but not in the ASQ		-5		
After adjustments: Suitable Acres Comparable ASQ	656	356	525	243

Withdrawals under present planning procedures have occurred in a different order than in the TM Plan. In addition, MMRs are reflected in Alternative A and not in NC, and the two Alternatives' suitable landbases are different. For these reasons, the acres shown in this table for the Bull Run and for the Unit Plans are different for Alternatives NC and A.

1/The potential yield shown in the TM Plan is 387 MMBF and does not reflect volume from the Bull Run Watershed.

2/The 29,000 acres corresponding to Alternative NC pertain to unit plan adjustments to the TM Plan since 1977. The 37,000 acres corresponding to Alternative A refer to all unit plans (before and since 1977).

It also provides a program mix that addresses RPA targets for other resources such as wildlife, range and developed recreation. The Bull Run Municipal Watershed would be managed according to the Bull Run Planning Unit EIS for the production of potable water. Management of recreational opportunities would emphasize the use of existing and new roads for dispersed motorized recreation, and the use of developed sites such as campgrounds.

Alternative C

This alternative is developed in response to the Public Issues concerning adequate timber supplies and community stability. It would provide maximum timber harvests during the next thirty years consistent with resource protection provided by minimum management requirements. Alternative C is designed to come as

close as possible to meeting the objectives of the Forestry Program For Oregon (FPFO), proposed by the Oregon Department of Forestry which is 113.3 MMCF/yr (565 MMBF) for the first decade. Under Alternative C all land suitable for growing trees would be managed for intensive timber production. Timber harvesting would be on a regularly scheduled basis in the Bull Run Watershed. For the first thirty years, timber harvesting would be above the long-term sustained yield capacity of this alternative. This represents a departure from nondeclining flow of timber.

Alternative D

This alternative is structured to address important non-timber Public Issues and management concerns while producing a timber harvest in the first ten years that does not adversely affect local communities. This re-

quires a departure from nondeclining flow of timber. Alternative D differs from others developed in response to the Public Issue on timber supply by placing primary emphasis on the first decade. It has been designed to maintain near-current levels of timber production by harvesting above the alternative's LTSYC during the first decade. This alternative would support local timber-dependent communities, while responding in some degree to Public Issues on recreation, wildlife, fish and water quality. Among the other resources emphasized in this alternative are selected Special Interest Areas, travel corridors of exceptional scenic value, watersheds needed to maintain anadromous fish populations, and the Bull Run Municipal Watershed.

Alternative E (Preferred)

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

Alternative F

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

Alternative G

This alternative is designed to respond moderately well to all public issues. Public Issues related to water quality, fish, wildlife, recreation and unroaded resources would be addressed the same as under the current planned objectives and guidelines on most areas of the Forest. This is intended to assure that the most important areas have been selected to manage for these resources. This alternative manages the land for the same uses as Alternative E. However, it schedules timber harvests on the basis of nondeclining yield. It does so to maintain options to respond in the future to other Public Issues related primarily to unroaded areas and wildlife habitat.

NOTE: The opportunity for increasing the first decade volume above LTSYC from this land base by departing from nondeclining flow is discussed in Alternative E.

Alternative H

This alternative is developed to supply recreational opportunities in primitive or natural settings, away from roads and other major evidence of human activity. It precludes future development in all presently unroaded areas, and in places on the Forest adjacent to Wildernesses and unroaded areas that also offer primitive and semi-primitive nonmotorized recreation opportunities. Alternative H would also preserve existing old growth timber stands as a diminishing biological and cultural resource. Retaining old growth would provide complementary benefits for fish and wildlife habitats, and maintain or improve scenic quality. 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.

Alternative I

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

3 . Management Areas

Each alternative is implemented through application of selected prescriptions assigned to the various lands on the Forest. A management prescription is a cost-efficient combination of management practices and intensities selected and scheduled to attain certain goals and objectives while complying with specified standards.

A management area is a unit of land to which a common management prescription is applied. In essence, the management area is a unit of land to be managed for certain goals and objectives, to achieve or maintain a desired condition in the future. Although certain resources are emphasized, each management area provides for a combination of uses. The management area locations can be found on the alternative maps accompanying the DEIS.

The management areas developed by the Forest are grouped into three categories according to the type and degree of planned development for each area. These categories, labeled A, B, and C, represent broad differences in the use, intensity, and objectives for each area.

A listing of the management areas in each category is presented below. More detailed descriptions are found in Chapter II of the DEIS and in the proposed Forest Plan. Acres allocated to each of these management areas for each alternative are displayed in Table S-2. Following, Table S-3 displays a tabulation of acres suitable for timber production by alternative arrayed by categories of management areas. Acreages in the different management areas vary by alternative, reflecting the differences in emphasis of the alternatives.

It has been noted that one of the 10 alternatives considered in detail, Alternative NC, is based on management area designations which predate the management area development process. Alternative NC represents the Mt. Hood National Forest Timber Management Plan, which received final administrative approval on Feb. 22, 1978. The term "Streamside Management Unit" used in that Plan is similar to the "Key Site Riparian Habitat" term used in this DEIS. Other management area acre designations are harder to discern in the Ten Year Management Plan. For this reason, acreage estimates shown in this DEIS related to Alternative NC are less accurate than those shown for the other nine alternatives.

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.

Category A Management Areas

Designation	Area Name
A1	Bull Run Planning Unit ¹
A2	Wilderness
A3	Research Natural Areas
A4	Special Interest Areas
A5	Unroaded Recreation-no Timber Harvest
A6	Roaded Recreation-no Timber Harvest
A7	Old Growth
A8	Northern Spotted Owl Habitat Areas
A9	Key Site Riparian Habitat
A10	Developed Recreation Sites
A11	Winter Recreation Areas
A12	Outdoor Education Areas

¹/Chargeable harvest occurs in the buffer zone as indicated in the existing Bull Run FEIS. However, the Bull Run drainage is subject only to non-chargeable harvesting if it is assigned to this management area (as is the case for all alternatives except for alternative C).

Category B Management Areas:

Management objectives in category B Management Areas are designed to achieve specific resource objectives, as well as produce timber, while achieving an objective of promoting a healthy, growing forest, through timber management.

In order to achieve the stated resource management objectives for specific management areas in this category and to meet ASQ goals, chargeable timber harvest shall be scheduled in Category B Management Areas. Compared to Category C Management Areas, these management areas have additional restrictions regarding rate of harvest, sizes of openings, and minimum rotations: i.e., how old a timber stand is before it is harvested. It is estimated these additional restrictions have the effect of reducing potential timber harvests by as much as two-thirds of that expected from Category C Management Areas.

Table S-2
Acreage In Management Areas By Alternative

(Alternatives are listed left-to-right in accordance with most suitable acres in the timber base.)
(NE indicates Not Estimated)

MANAGEMENT AREA	A C R E S									
	NC NOCHANGE	C	B (RPA)	D	E PREFERRED	G	A NO ACTION	F	I	H
Category A										
A1-Bull Run ^{1/}	90,600	0	90,600	90,600	90,600	90,600	90,600	90,600	90,600	90,600
A2-Wilderness ^{2/}	185,300	185,300	185,300	185,300	185,300	185,300	185,300	185,300	193,400	185,300
A3-RNA ^{3/}	NE	1,300	1,300	1,300	1,300	1,300	1,650	1,200	1,050	1,300
A4-SIA	NE	50	50	52,750	54,950	54,950	58,250	22,850	38,850	26,000
A5-Unroaded Rec.	NE	0	0	1,500	5,950	5,950	0	39,000	49,700	80,950
A6-Roaded Rec.	NE	0	0	1,500	750	750	0	20,850	31,200	44,500
A7-Old Growth	NE	0	0	0	0	0	0	0	0	130,700
A8-Spotted Owl ^{4/}	NE	43,400	37,350	37,350	37,350	37,350	37,350	47,300	62,600	37,350
A9-Key Sites ^{4/ 5/}	NE	10,100	9,200	11,700	11,700	11,700	9,200	18,700	21,700	11,700
A10-Dev. Rec.	NE	650	650	650	650	650	650	650	650	650
A11-Winter Rec.	NE	6,450	6,450	6,450	6,450	6,450	6,450	6,250	5,950	6,450
A12-Outdoor Ed.	NE	450	450	450	450	450	450	450	450	450
Subtotal "A"	402,950	247,700	331,350	389,550	395,450	395,450	389,900	433,150	496,150	615,950
Category B										
B1-W/S Rivers	NE	0	0	18,200	18,200	18,200	5,550	15,450	16,750	15,950
B2-Viewsheds	NE	0	0	46,050	102,500	102,500	139,650	235,500	166,050	96,550
B3-Roaded Rec.	NE	0	0	0	750	750	0	0	0	0
B4-Pine/Oak	NE	0	0	15,600	14,850	14,850	0	6,750	5,300	5,200
B5-Woodpecker/ Pine Marten ^{4/}	NE	68,800	61,000	61,000	61,000	61,000	61,000	80,700	90,550	61,000
B6-Watershed	NE	0	0	23,000	34,900	34,900	0	57,150	56,500	31,950
B7-Gen. Rip. ^{4/}	NE	72,700	66,500	66,500	66,500	66,500	66,500	88,650	116,000	66,500
B8-Earthflows	NE	0	0	16,350	16,350	16,350	0	14,100	12,350	7,800
B9-Wildlife/Visual	NE	0	0	0	4,450	4,450	0	0	0	0
Subtotal "B"	317,700	141,500	127,500	246,700	319,500	319,500	272,700	498,300	463,500	284,950
Category C										
C1-Timber Emphasis	338,750	670,200	600,550	423,150	344,450	344,450	396,800	127,950	99,750	158,500
Total = Sum of Gross Acres in Categories A + B + C	1,059,400	1,059,400	1,059,400	1,059,400	1,059,400	1,059,400	1,059,400	1,059,400	1,059,400	1,059,400
Area Managed for Timber ^{6/}	656,450	608,300	561,200	521,200	513,900	513,400	508,800	488,300	425,900	278,600

^{1/} An additional 4,400 acres of non-Federal land occur in the Bull Run. In Alternative C, the Bull Run Municipal Watershed will be managed for timber production (Management Area C1), except for those areas needed to meet minimum management requirements.

^{2/} An additional 700 acres of non-Federal land occur within the boundaries of existing Wilderness.

^{3/} The acreage of three RNA's proposed in several alternatives is not reflected in this chart because the sites lie inside A1-Bull Run and A2-Wilderness Management Areas.

^{4/} This management area satisfies a minimum management requirement. MMRs may also be satisfied by other management areas, such as A2-Wilderness. In some alternatives, these A8, A9, B5 and B7 management areas include more than the acreage needed to satisfy minimum management requirements.

^{5/} Alternative NC, which is based on the current Timber Management Plan, allocates 4,600 acres to be managed for riparian objectives which are similar to those associated with Management Area A9.

^{6/} Includes land in Management Area Categories B and C, but does not include those portions of these management areas that have been identified as unsuitable for timber management.

Site specific conditions may require more restricted timber harvest or no timber harvest activities to occur in particular geographic areas during a given decade, while in other areas more timber harvesting may occur in order to achieve the overall timber harvest goal. The individual Category B Management Areas are as follows:

Category B Management Areas

Designation	Area Name
B1	Wild, ¹ Scenic & Recreational Rivers
B2	Scenic Viewsheds
B3	Roaded Rec. - Reduced Timber Harvest
B4	Pine/Oak Habitat
B5	Woodpecker/Pine Marten Habitat
B6	Special Emphasis Watersheds
B7	General Riparian Areas
B8	Earth Flows
B9	Wildlife/Visual Areas

1/Wild segments of Wild and Scenic Rivers have no chargeable timber harvest. Scenic and Recreational segments allow some chargeable harvest.

Category C Management Area:

There is only one Category C Management Area, designated as area C1. Chargeable timber harvest is scheduled in this area as a dominant objective, while other outputs would be jointly produced. Management

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

Management Area Acreages

Table S-2 shows how the Forest's 1,059,400 acre land base is allocated among the management areas for the alternatives. Not all of the acres in Category B and C are suitable for timber production; suitable and unsuitable acres are intermixed in these areas (except in Alternative NC). The total amount of suitable acres in these two categories is noted at the bottom of Table S-2.

Table S-3 follows Table S-2 and shows how the alternatives' tentatively suitable land bases are allocated among the three categories of management areas. A land suitability map is included in the map packet that accompanies this document.

When tentatively suitable acres are allocated to Category A Management Areas, they become unsuitable for timber management and are so listed in the table. Once allocated to Category B or C Management Areas, the tentatively suitable acres gain a designation of suitable.

Table S-3
Acres Suitable For Timber Production By Alternative

	A L T E R N A T I V E									
	NC (No Change)	C	B (RPA)	D	E (Preferred)	G	A (No Action)	F	I	H
A. Tentatively suitable for timber production.	753,000	647,200	647,200	647,200	647,200	647,200	647,200	647,200	647,200	647,200
B. Unsuitable										
1. Category A	96,500	38,900	86,000	126,000	133,300	133,200	121,000	158,100	220,600	355,500
2. Not cost-efficient ^{1/}	0	0	0	0	100	600	17,400	800	700	13,100
Total Unsuitable	96,500	38,900	86,000	126,000	133,300	133,800	138,400	158,900	221,300	368,600
C. Suitable										
1. Category B	317,700 ^{3/}	92,400	84,600	152,000	203,900	203,400	123,300	374,100	339,000	148,500
2. Category C	338,800 ^{4/}	515,900	476,600	369,200	310,000	310,000	385,000	114,200	86,900	130,100
Total Suitable ^{2/}	656,500	608,300	561,200	521,200	513,900	513,400	508,800	488,300	425,900	278,600

1/Given the economic assumptions upon which the FORPLAN model operated, these acres were not selected for harvest. These represent areas which are potentially available for harvest, given changes in assumptions about costs and/or prices.

2/In order to facilitate the comparison of alternatives, they are often arrayed in tables and graphs in terms of the total of Category B and Category C acres.

3/The existing Timber Management Plan refers to these as the "marginal" component and "special" component.

4/The existing Timber Management Plan refers to these as the "standard" component.

Table S-4
PNV And Discounted Costs And Benefits
(Millions of dollars, discounted over the 150 year planning horizon.)
("Change" is measured relative to the next alternative.)

Benchmark Or Alternative	Present Net Value		Discounted Costs		Discounted Benefits	
	PNV	Change	Costs	Change	Benefits	Change
Max PNV (Benchmark)	3042		990		4032	
Alt C	3015	- 27	1073	+ 83	4088	+ 56
Alt NC	2998	- 17	849	-224	3847	-241
Alt D	2972	- 26	872	+ 23	3844	- 3
Alt A (No Action)	2952	- 20	807	- 65	3759	- 85
Alt E (Preferred)	2944	- 8	828	+ 21	3772	+ 13
Alt G	2941	- 3	789	- 39	3730	- 42
Alt B (RPA)	2933	- 8	944	+155	3877	+147
Alt F	2822	-111	715	-229	3537	-340
Alt I	2762	- 60	684	- 31	3446	- 91
Alt H	2501	-261	559	-125	3060	-386

Note that Alternative NC begins with a 753,000 acre tentatively suitable land base, while the tentative base for the other alternatives is 647,200 acres.

C. Comparison Of Alternatives

1. Differences in Present Net Values

Present Net Value (PNV) is the difference between all economic benefits and costs produced by an alternative over a specified period of time, after all economic benefits and costs have been discounted to a common base year. Dollar values are used to estimate the benefits of timber harvested, livestock produced, and recreational uses for each alternative. PNV is one measurement of economic efficiency which is an important objective of National Forest management. Economic efficiency measures the effectiveness of expenditures in producing priced benefits.

The preferred alternative should produce the greatest net public benefits (NPB). When the net public benefit of each alternative is being examined, nonpriced outputs and effects must be also considered. Nonpriced costs and benefits include social effects, economic effects, levels of goods and services produced, and overall environmental effects. Changes in recreation opportunities, wildlife habitats, or scenic vistas illustrate what is meant by nonpriced outputs.

The proposed alternatives are ranked by decreasing PNV in Table S-4. The Maximum PNV Benchmark is included for comparison. Changes in PNV and total dis-

counted costs and 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.

By comparing Figure S-1 and Table S-4, it is evident that PNV generally decreases as ASQ decreases. Exceptions are Alternatives E and B where timber benefits rise with accelerated departure harvest but costs rise more to reduce PNV. Note that the change in PNV between Max PNV Benchmark and Alternative C is less than 1 percent. Also, successive changes between individual alternatives from second ranked Alternative C to eight ranked B are all less than 1 percent. Between the last three ranked alternatives, the differences increase to 9 percent.

2. Alternatives' Response to the Public Issues

Alternative management plans were designed to address the Public Issues in different ways. Alternatives can best be compared to each other by identifying how well each alternative responds to all of the Public Issues. The "Indicators of Responsiveness" to the Public Issues, are described in Table S-5. The alternatives responses to these indicators, and to economic indicators, are quantified in Table S-6.

Figures S-1 thru S-6 present the Indicators of Responsiveness to Public Issues graphically. The alternatives are arrayed within the available decision-space. A discussion of tradeoffs among alternatives follows the tables and graphs.

Table S-5
Indicators Of How The Alternatives Respond To The Public Issues

PUBLIC ISSUE GROUP	Indicators of Responsiveness	What The Indicator Measures
ISSUE GROUP 1: TIMBER	Average Annual Volume Offered (MMBF), First Decade: Allowable Sale Quantity, Green (ASQ) . . . Timber Sale Program Quantity (TSPQ) . . . Long-Term Sustained Yield Capacity (MMCF) . .	Green, merchantable volume offered (million board feet per year) Total projected volume offered (million board feet per year) The annual capacity of the Forest to produce green, merchantable volume 150 years after Forest Plan implementation (million cubic feet per year)
ISSUE GROUP 2: FISH AND WATER	Aquatic Habitat Stability Index (10 = highest) Acres Assigned to Meet Riparian Objectives. .	An index based on the Forest's capacity to provide aquatic habitat 20 years after Forest Plan implementation (million cubic feet per year) Amount of land in Management Areas A1 (Bull Run), A9 (Key Riparian), B6 (Special Watersheds), B7 (General Riparian)
ISSUE GROUP 3: WILDLIFE	Acres of Old Growth after 50 Years Acres of Young Growth after 50 Years	Total area supporting trees at least 200 years old, 50 years after Forest Plan implementation Total area supporting trees less than or equal to 20 years old, 50 years after Forest Plan implementation
ISSUE GROUP 4: RECREATION	Expected Visual Condition after 50 Years. . . Natural Appearing Viewsheds Viewsheds Appearing Slightly Altered. . . Dispersed, Non-Wilderness, Semi-Primitive Recreation Opportunities After 50 Years Motorized (M RVDs/year) Nonmotorized (M RVDs/year)	Appearance of the Forest's 48 most sensitive viewsheds, 50 years after Plan implementation Number of viewsheds less than 5% visually altered Number of viewsheds less than 10% visually altered Visitor days of semi-primitive motorized recreation, 50 years after implementation Visitor days of semi-primitive nonmotorized recreation, 50 years plan implementation
ISSUE GROUP 5: UNROADED AREAS	Areas Retaining Unroaded Characteristics After 15 Years. After 50 Years.	Of the 10 existing nonwilderness unroaded areas, how many will remain essentially unroaded 15 years after the Forest Plan is implemented Of the 10 existing nonwilderness unroaded areas, how many will be in management areas that allow no roads
ISSUE GROUP 6: COMMUNITIES	Average Annual Payments to Counties(Millions) Change in Employment (Number of Jobs)	First decade average annual amount paid by the U.S. Treasury based on gross Forest receipts Relative change (from 1977-1986 base period) in Forest contributions to employment sources in the four county influence area

Table S-6

Tradeoffs Between Economic Benefits and Responses to Issues

Alternative	ECONOMICS					TIMBER ISSUE			FISH AND WATER ISSUE		WILDLIFE ISSUE	
	(Millions of Dollars)					First Decade, Avg Annual MMBF		LTSYC	Decade 1-2 Stability Index	Riparian Emphasis Acres	Acres After 50 Yrs	
	PNV	Net Receipts Ave. Annual		Noncash Benefits Average Annual		ASQ, Green	TSPQ	(MMCF)			Old Growth	Young Growth
		Decade 1	Decade 2	Decade 1	Decade 2							
C	3,015	+ 8	+ 5	27	27	393	493	565	1.2	82,800	193,500	101,800
NC(No Change)	2,998	+12	+12	27	33	339	443	651	0.9	95,200	228,000	105,000
D	2,972	+ 5	+ 6	28	38	287	385	456	2.7	191,800	249,900	87,800
A(No Action)	2,952	+ 5	+ 7	27	37	229	316	469	3.3	166,300	276,100	68,400
E(Pref.)	2,944	+ 3	+ 5	28	38	255	347	438	3.5	203,700	264,300	67,400
G	2,941	+ 3	+ 5	28	38	222	307	438	3.8	203,700	273,100	73,300
B (RPA)	2,932	+ 9	+ 6	27	27	335	444	514	1.3	166,300	216,200	85,200
F	2,822	- 1	+ 3	28	38	166	239	399	8.0	255,100	315,900	60,200
I	2,762	- 4	+ 1	28	39	136	202	340	9.2	284,800	342,400	62,600
H	2,501	- 8	- 3	28	40	62	108	209	7.9	200,800	409,300	36,000

Alternative	RECREATION ISSUE				UNROADED ISSUE		COMMUNITIES ISSUE	
	(After Fifty Years)				Areas Unroaded		1st Decade Ave. Annual	
	Viewshed Appearance		Supply of Dispersed Semi-Primitive RVD's		After 15 Years	After 50 Years	Payments to Counties (Million \$)	Changes in Jobs
	Nat- ural	Slight Altered	Motorized	Non-Motorized				
C	5	2	0	3,000	1	0	12.7	+3,700
NC(No Change)	10	2	8,000	61,000	4	4	11.4	+ 500
D	11	9	8,000	54,000	3.5	3.5	9.9	+ 800
A (No Action)	12	4	7,000	59,000	7	4	8.1	- 300
E (Pref.)	17	14	9,000	75,000	4	4	8.9	+ 200
G	17	14	9,000	75,000	6	4	7.9	- 500
B (RPA)	5	2	0	3,000	1	0	11.4	+1,800
F	24	22	13,000	105,000	5	3.5	6.2	-1,700
I	30	17	20,000	157,000	10	10	5.2	-2,300
H	38	6	28,000	206,000	10	10	2.8	-3,900

Figure S-1

Public Issue #1 - Timber Production

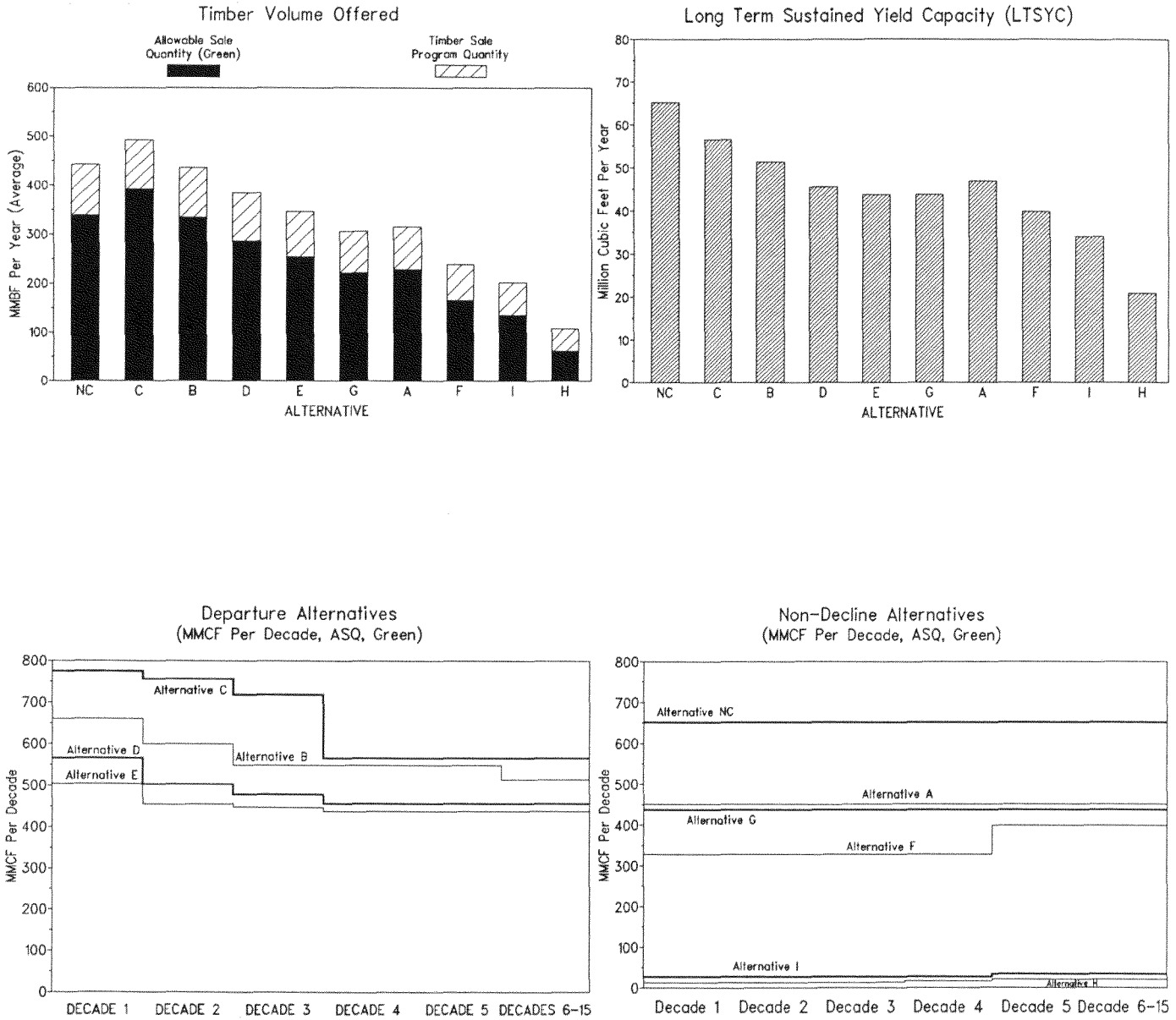


Figure S-2

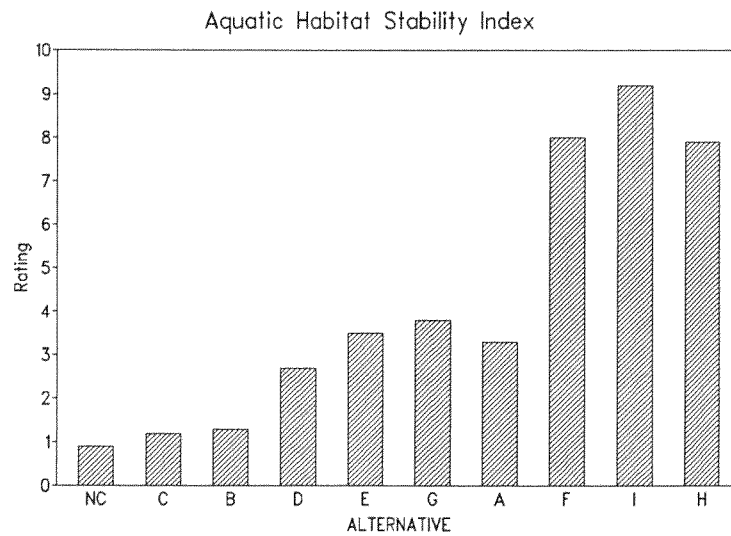
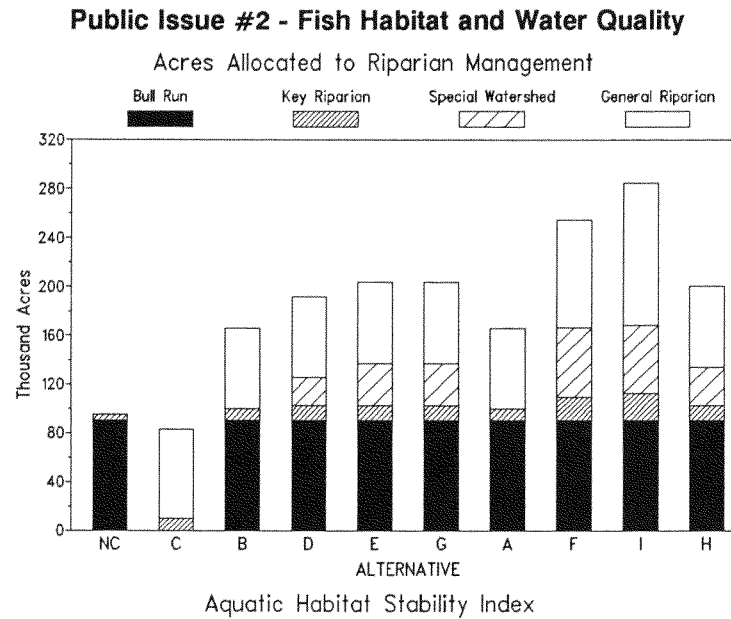


Figure S-3

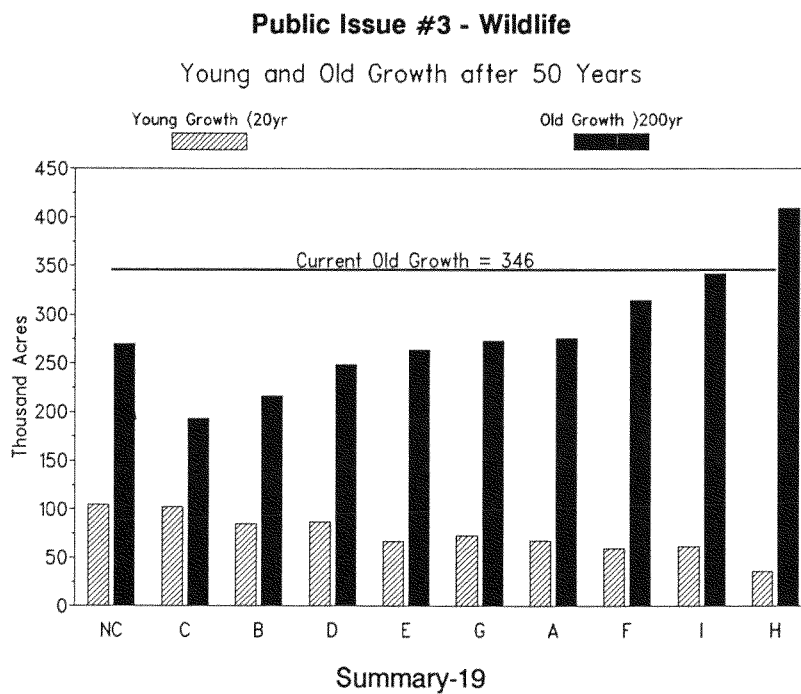
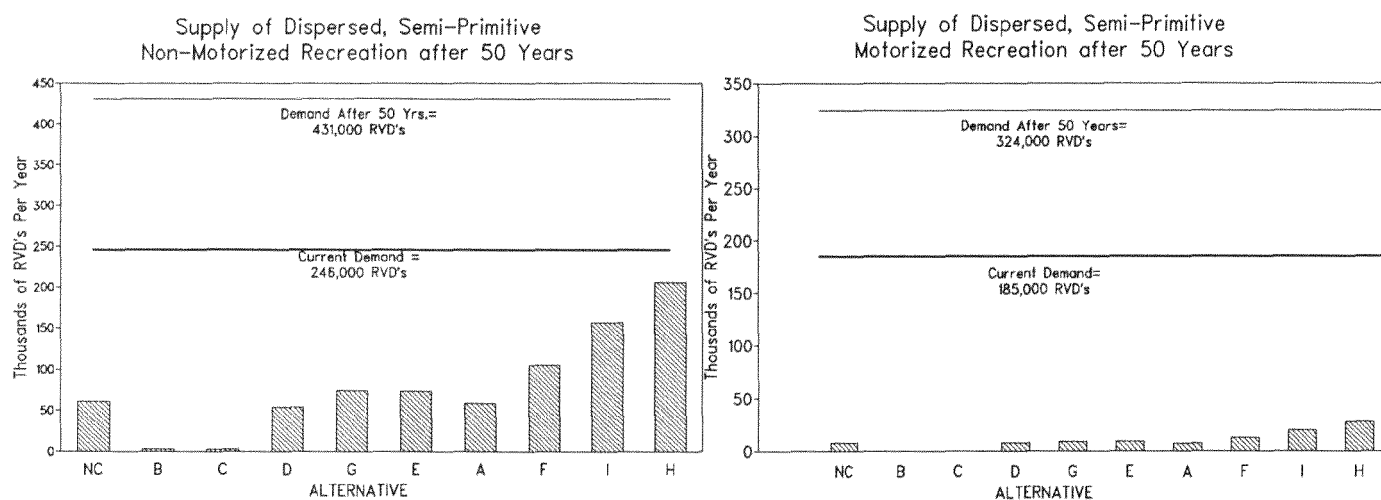


Figure S-4

Public Issue #4 - Recreation



Expected Future Condition of the Forest's Viewsheds (48 of the Forest's most visually sensitive viewsheds)

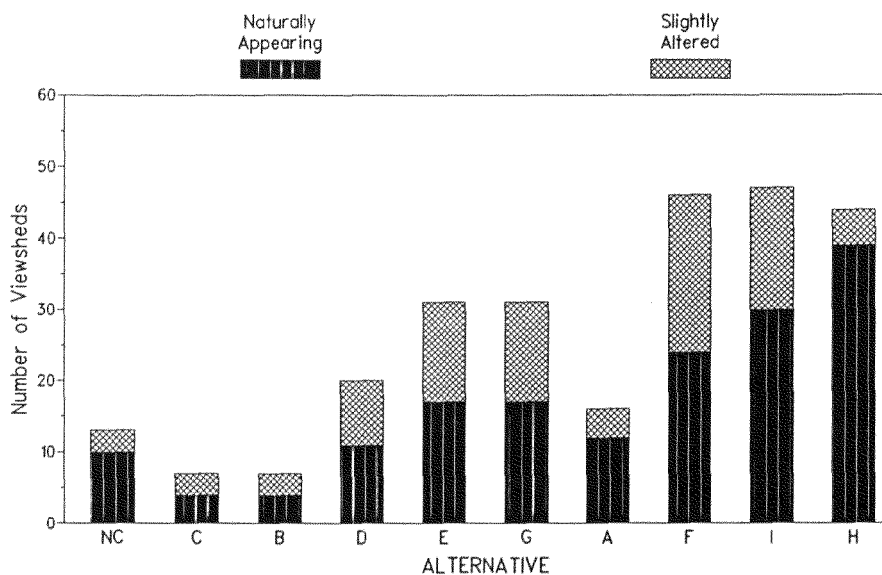


Figure S-5

Public Issue #5 - Unroaded Areas

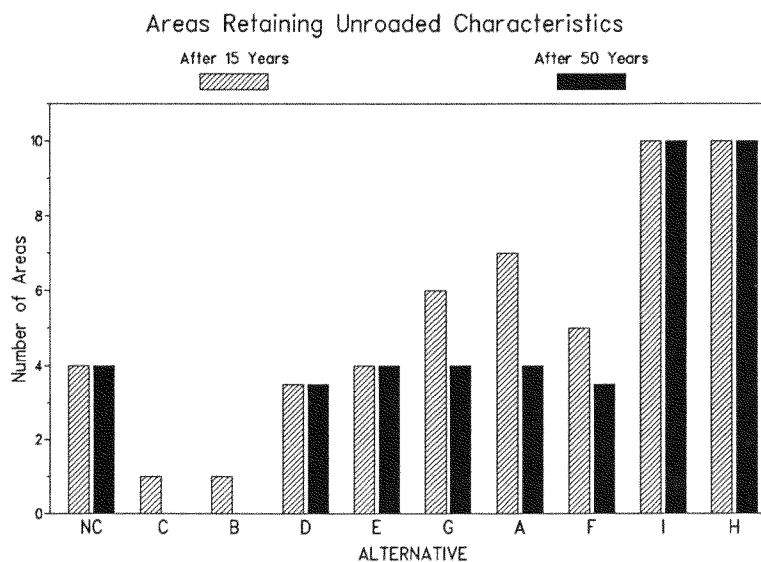
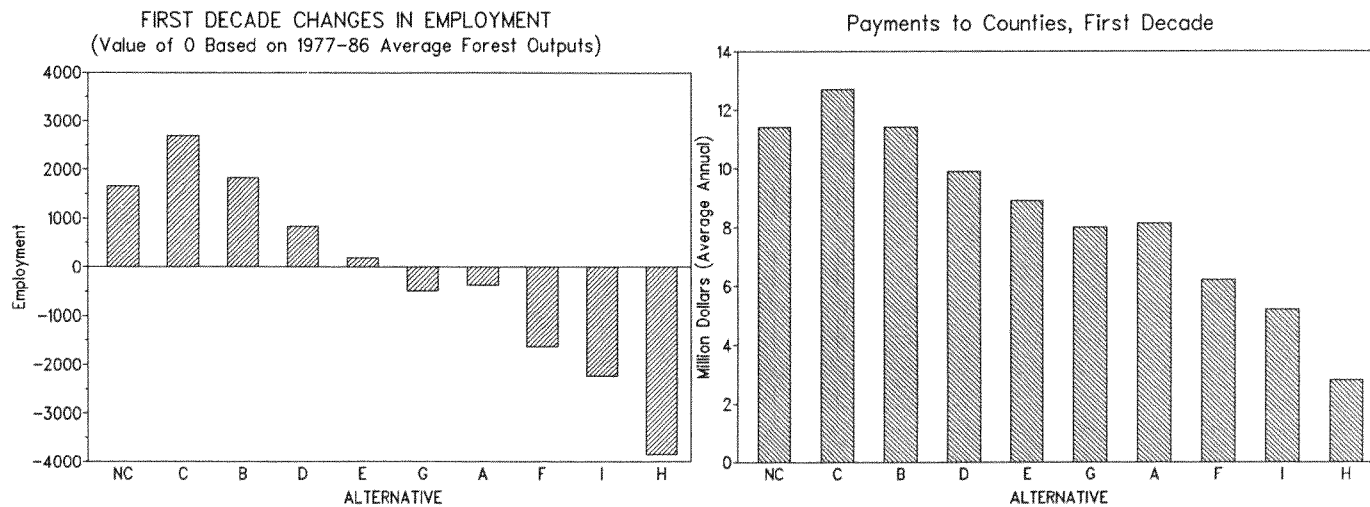


Figure S-6

Public Issue #6 - Community Stability



3. Differences and Similarities of Individual Alternatives

The Indicators of Responsiveness to the Public Issues for each alternative are presented in Table S-6, in order of incremental decreases in Present Net Value (PNV). This is one method of displaying the differences and similarities of the alternatives. The reader can compare any two alternatives in the same or different manner.

A narrative comparison of the alternatives in terms of incremental differences in PNV will now be presented. The incremental differences in PNV provide an estimate of the differences in Net Public Benefits between the alternatives. Since the goal of planning is to maximize Net Public Benefits while responding to the Public Issues, the discussion identifies how each alternative's response to the Public Issues reduces PNV. By comparing each alternative with the one that precedes, the incremental tradeoffs between responses and PNV or Net Public Benefits can be shown.

Alternative C

Alternative C has the highest PNV because its timber harvest would be the highest among the alternatives. Net receipts during the first decade, however, would rank third. Net receipts are returns to the Treasury which primarily include timber cash receipts less all costs of managing the Forest. The lower ranking occurs because less valuable trees would be harvested and activities would occur in more areas where logging and road construction costs are high. The required harvest levels for the first five decades would result in some scheduling choices that do not maximize economic returns. High levels of fish and wildlife habitat investment would also reduce net receipts. This alternative and Alternative B, which harvests the third highest amount of timber, provide the fewest noncash benefits in the second decade. Noncash benefits are values that Forest users receive but do not actually pay for.

The high level of timber harvest would stimulate the highest potential jobs, wages, and payments to counties during the first decade. Timber-related jobs and payments to counties are expected to decline in decades two through five as the Allowable Sale Quantity (ASQ) drops approximately seven percent per decade. The ASQ will equal the Long-Term Sustained Yield Capacity (LTSYC) in the fifth decade and thereafter.

All suitable acres, except for those reserved for Minimum Management Requirements (MMRs), are eventually harvested. Thus, the Bull Run and all 10 unroaded areas are harvested. This results in the lowest amount of old growth remaining after 50 years of the alternatives considered, and adversely affects wildlife species which are dependent on such habitat. Conversely, wildlife

which favors the habitat provided by young growth should be positively affected. Alternative C provides more such habitat than does any alternative other than Alternative NC.

In 50 years Alternative C will provide the fewest (2) naturally appearing viewsheds, the fewest (0) semi-primitive motorized RVDs/year, and the fewest (3,000) semi-primitive nonmotorized RVDs/year as do Alternatives NC and B.

Although it explicitly manages the fewest number of acres for fish habitat and water quality purposes, the habitat/quality index for this alternative is higher than Alternative NC. This is because Alternative C has MMRs, whereas Alternative NC does not.

There would be no rivers recommended for Wild and Scenic River classification, nor would any new areas be recommended as Special Interest Areas (SIAs) or as Research Natural Areas (RNAs).

Alternative NC (No Change)

This alternative has a PNV which is less than 1 percent lower than Alternative C's, but its first decade net receipts are 50 percent higher. This is primarily because Alternative NC harvests less timber, but its unit costs are also less.

This is the only alternative which has a 753,000 acre land base, as compared to the 647,000 acre tentatively suitable land base for the other alternatives. The "tentatively suitable" land base is that which, before considerations for MMRs, can legally be considered for timber management. In addition to starting with a land base which is 106,000 acres larger, this is the only alternative which does not subsequently reduce its land base to account for MMRs.

Compared to Alternative C, this alternative manages 15 percent more acres for fish habitat and water quality purposes. This is because the Bull Run Watershed will continue to be managed under existing direction in Alternative NC. However, because this alternative does not meet riparian MMRs, its fish habitat and water quality stability index is the lowest of the alternatives considered. Alternative C has the second lowest index value. In 50 years there will be 40 percent more old growth under Alternative NC than under Alternative C.

The first decade ASQ of Alternative NC is 14 percent less than Alternative C's. Ten percent less revenues will be paid to the counties and 3,200 fewer jobs will exist.

Alternative NC maintains the unroaded characteristics of four areas for at least 50 years; Alternative C does not leave any such areas unroaded for this period of time. This is the main reason why Alternative NC provides 8,000 more motorized, semi-primitive RVDs/year in the

year 2030. Alternative NC also provides 58,000 more nonmotorized, semi-primitive RVDs during the year 2030 than does Alternative C.

Alternative NC recommends the Roaring and Salmon Rivers for classification as Wild and Scenic, provides for all existing SIAs and RNAs, and adds five SIAs and two RNAs. Alternative C does not recommend any rivers nor makes proposals for SIAs or RNAs.

Alternative D

There is less than one percent difference between the PNVs of Alternatives D and NC. Alternative D's first decade net receipts are about 58 percent less, payments to counties during the first decade are 13 percent less, but there are 300 more jobs. The first decade ASQ is 15 percent less. The main reason why these decreases in timber-related indicators do not significantly affect PNV is because a larger component of PNV, that related to nontimber benefits, is essentially the same for both alternatives.

Compared to Alternative NC, about twice as many acres are explicitly managed to meet fish habitat and water quality objectives, and the index is three times better. After 50 years there will be about 7 percent less old growth and 16 percent more young growth.

Fifty years hence there will be one additional naturally appearing viewshed and 7,000 less nonmotorized, semi-primitive RVDs, although the same number of semi-primitive motorized RVDs. Unroaded areas will be managed in about the same way as under Alternative NC.

Alternatives D and NC both recommend two rivers for classification under the Wild and Scenic River System. Both alternatives retain existing SIA's and RNA's. Alternative D provides for five more additional SIA's than does alternative NC. Alternative D does not recommend adding additional RNA's.

Alternative A (No Action)

There is less than a one percent difference between the PNV of this alternative and that of Alternative D. Net receipts and noncash benefits are essentially the same.

During the first decade, Alternative A's ASQ is 20 percent less, payments to counties are 18 percent less, and there are 1,100 fewer jobs.

About 13 percent fewer acres are explicitly managed for fish habitat and water quality purposes but, because there are fewer impacts of timber harvesting, the corresponding quality index is 22 percent higher. After 50 years there will be ten percent more old growth and 23 percent less young growth. There will be one additional naturally appearing viewshed. The number and type of semi-primitive RVDs supplied will change little.

After the first 15 years, Alternative A retains twice as many unroaded areas. However, after 50 years, Alternative A leaves 4 areas undeveloped whereas Alternative D leaves 3.5 of such areas undeveloped.

Alternatives D and A both recommend two rivers for classification under the Wild and Scenic River System. Alternative D provides for five more SIAs than does Alternative A. Alternative A provides for two additional RNAs, Alternative D does not recommend adding additional RNAs.

Alternative E (Preferred)

This alternative's PNV is essentially the same as that of Alternative A. This alternative's ASQ is 11 percent higher during the first decade. However, since this alternative departs from nondeclining flow, and Alternative A does not, the difference between their ASQs drops to 7 percent by the fifth decade. Despite the first decade increased ASQ of this alternative, its first decade net receipts are 40 percent less than Alternative A's. This is primarily the result of increased costs associated with developing 3 unroaded areas for timber production during the first 15 years. However, since these areas are developed after the 15th year in Alternative A, the non-cash benefits provided by both alternatives are about the same.

The increase in harvest levels causes a similar increase in payments to counties and results in 500 more jobs during the first decade.

In 50 years, compared to Alternative A, this alternative will provide 16,000 more nonmotorized, semi-primitive and 2,000 more motorized, semi-primitive RVDs per year. Alternative E will also result in 5 additional naturally appearing viewsheds and 10 additional slightly altered viewsheds.

About 22 percent more acres will be explicitly managed for fish habitat and water quality purposes. This will result in a slight increase in the habitat/quality index from 3.3 to 3.5. In 50 years, Alternative E will provide 4 percent less old growth but about the same amount of young growth.

Alternatives A and E both maintain existing SIAs and RNAs and propose adding additional areas. Compared to Alternative A, this alternative provides for 6 more SIAs and one more RNA. Both alternatives recommend the Roaring and Salmon Rivers for classification under the Wild and Scenic River System. Alternative E recommends adding one additional river, the Clackamas, for classification.

Alternative G

Alternatives E and G have the same management area designations. So, they have the same SIAs and RNAs,

and they recommend the same rivers for classification under the Wild and Scenic River System. After 50 years both alternatives will provide the same number of naturally appearing viewsheds and semi-primitive RVDs.

The two alternatives have essentially the same PNV, net receipts, and noncash benefits. This is due to offsetting factors: Alternative E returns more gross receipts, but it costs more, primarily for mitigation of potentially adverse effects of harvests on water quality and fish and wildlife habitat.

The difference in the two alternatives relates to the fact that Alternative E is a departure from nondeclining timber flow and Alternative G is not. In the first decade in G there is a 13 percent difference in ASQ, 11 percent difference in payments to counties, and about 700 fewer jobs related to timber harvesting on the Forest. These differences become progressively smaller during decades two through four. By the fifth decade both alternatives have the same ASQ, which is equal to their LTSYC.

Alternative G has a slightly higher fish habitat and water quality index. After 50 years there will be 3 percent more old growth, and 9 percent more young growth. In contrast to Alternative E, Alternative G defers harvesting in all of the Twin Lakes unroaded area and half of the Larch and Wind Creek unroaded areas for 15 years.

Since Alternative G's ASQ is less than E's, and since both alternatives have the same land base, there is a greater probability of producing timber without incurring unacceptable environmental consequences at Alternative G's level of harvest.

Alternative B (RPA)

This alternative allocates all tentatively suitable areas, except for the Bull Run drainage, to intensive timber management. In so doing, it affords no special management to any of the Special Interest Areas or Research Natural Areas so managed under Alternative G. It also recommends that no rivers be classified under the Wild and Scenic River System, and it leaves none of the 10 unroaded areas in their present condition. In the first decade this results in a 51 percent increase over the ASQ of Alternative G, a 44 percent increase in payments to counties, about 2,300 more jobs, and three times as many net receipts. However, the PNVs of the two alternatives are essentially the same. This is because Alternative B costs substantially more, and because some of the additional volume of timber harvested is of lesser net value per acre than the average value of the timber harvested under Alternative G.

Alternative B's harvest schedule departs from nondeclining flow. This causes timber-related jobs and payments to counties to decline with timber harvest levels; about 5 percent per decade from decade one through decade 5.

The ASQ will equal the LTSYC in the fifth decade and thereafter. This will result in a relatively constant effect on payments and jobs after the fifth decade.

The fish habitat and water quality index drops by 66 percent primarily because about 19 percent less acres are explicitly managed for fish habitat and water quality purposes. In 50 years there will be 20 percent less old growth and 16 percent more young growth.

The two alternatives differ greatly in the types of recreation opportunities which will be supplied. In 50 years, Alternative B will provide 12 fewer naturally appearing and 12 fewer slightly altered viewsheds, no motorized, semi-primitive RVDs, and 96 percent fewer non-motorized, semi-primitive RVDs. This results in a 29 percent decrease, relative to Alternative G, in the non-cash benefits during the fifth decade. Alternative B defers harvesting in 5 fewer unroaded areas and eventually harvests 4 additional unroaded areas.

Alternative F

Alternative F has a PNV which is four percent lower than Alternative B's. This is due to much larger, though offsetting, differences in the cash and non-cash aspects of the two alternatives. From a cash standpoint, during the first decade, Alternative F realizes a negative \$1 million in annual net receipts (costs are larger than receipts), while Alternative B returns a positive \$9 million per year. The 45 percent difference in payments to counties and difference of 3,500 jobs during the first decade relates to the 50% difference in the two alternatives' first decade ASQ's. While Alternative B's first decade timber harvest level is above its LTSYC, Alternative F's is below its LTSYC.

From a noncash standpoint, the value of such benefits is 41 percent higher during the second decade under Alternative F. This reflects the following differences between Alternatives B and F: fish habitat and water quality acres increase 53 percent under Alternative F, and the corresponding stability index increases six-fold. The number of naturally appearing viewsheds in 50 years will be nearly five times greater. There will be eleven times the number of slightly altered viewsheds. After 50 years, Alternative F will provide 13,000 more motorized and 102,000 more nonmotorized, semi-primitive RVDs/year. Under Alternative F, five times as many unroaded areas will remain as such after 15 years.

The 22 percent reduction between the two alternatives in LTSYC, in part, reflects a 46 percent increase in wildlife habitat.

In contrast to Alternative B, Alternative F will do the following: all existing Special Interest Areas (SIAs) and Research Natural Areas (RNAs) will be retained. Seven additional areas will be managed as SIAs, and three ad-

ditional areas will be managed as RNAs. Two rivers will be recommended for classification under the Wild and Scenic River System.

Alternative I

The PNV of Alternative I is two percent less than the PNV of Alternative F. During the first decade, Alternative I returns four times fewer net receipts and about the same noncash benefits.

The first decade ASQ of Alternative I, compared to Alternative F, is 18 percent less and payments to counties are 16 percent less. There are 600 fewer jobs provided under Alternative I. First decade harvest levels of both Alternatives F and I are below their respective LTSYCs.

Alternative I manages 12 percent more acres than does Alternative F for fish habitat and water quality purposes and results in a corresponding increase in the associated stability index. After 50 years, Alternative I will provide eight percent more old growth and the same amount of young growth. It retains about three times as many unroaded areas in their current state after 50 years.

From a recreation standpoint, after fifty years, there will be six more natural and five fewer slightly altered appearing viewsheds, 7,000 more motorized, semi-primitive RVDs/year, and 52,000 more nonmotorized, semi-primitive RVDs/year.

Alternatives I and F both maintain existing SIAs and RNAs. Alternative I proposes thirteen additional areas, six more than Alternative F. Both alternatives provide for three additional RNAs. Alternative I recommends four rivers for classification under the Wild and Scenic River Systems, two more than Alternative F.

Alternative H

With a PNV 9 percent lower than Alternative I's, this alternative provides two times fewer net first decade receipts but about the same noncash benefits. The difference in receipts is a function of a 54 percent lower ASQ. Alternative H's first decade harvest level is below its LTSYC. Payments to counties are 46 percent less than in Alternative I, and there are 1,600 fewer jobs.

By being the only alternative to preclude harvesting in all existing old growth, 20 percent more old growth is provided in 50 years (12 percent less young growth). About 29 percent fewer acres are explicitly managed to meet fish habitat and water quality objectives, resulting in a 14 percent decrease in the associated quality index.

Thirty-eight of the Forest's most sensitive viewsheds will be naturally appearing in 50 years, as compared to the 30 in Alternative I. Forty percent more motorized, semi-primitive RVDs and 31 percent more nonmotorized, semi-primitive RVDs will be supplied 50 years from now. As is the case with Alternative I, all ten unroaded areas will remain such throughout the 150 year planning horizon.

Alternative H recommends two rivers for classification in the Wild and Scenic River System (Alternative I recommends four). Both alternatives recommend maintaining all existing SIAs and RNAs. Alternative H provides for four new SIAs, whereas Alternative I provides for 13 additional ones. Both alternatives call for adding three new RNAs.

D. Environmental Consequences Of Management Practices

Different mixes, locations, and schedules of practices in the alternatives are designed to produce different levels of resource outputs, such as recreation capacity, habitat capability, timber harvest and grazing use. The mix of management activities also produces environmental consequences that vary by alternative. A summary is provided here of only the potentially significant environmental consequences, whether direct or indirect.

Direction for each management area includes standards that provide mitigation measures to insure that long-term productivity of the land is not significantly impaired. Forest-wide standards and guidelines that apply to all prescriptions also protect the Forest's resources and mitigate adverse impacts. Mitigation reduces or eliminates the environmental consequences of management activities in alternatives.

Environmental consequences are described here in terms of their relationships to management activities. Chapter IV of the DEIS estimates the magnitude of these effects for each alternative. These estimates reflect the application of mitigation measures. Some of these estimates have been described in the comparison of alternatives earlier in this Summary.

1. Physical Consequences

Geology: There are 53,000 acres of unstable earthflow landforms on the Forest. Alternatives which emphasize timber harvest and associated road building activities in these sensitive areas will increase the risk of accelerating the rate of earthflow movement.

Soils: Impacts of the alternatives on soils fall into three categories: compaction, erosion, and fertilization. Alternatives which increase timber harvest will generally increase acres affected by erosion and compaction, and research indicates that such effects may reduce the capacity to grow trees. Alternatives which increase timber harvest will also increase the amount of acres treated with fertilizer, which will increase the capacity to grow trees.

Air: The major impact of the alternatives on air quality is the amount of suspended particulates produced by burning slash after timber harvests. Alternatives with high timber harvest levels will be likely to increase production of suspended particulates, because the opportunity to schedule burning to disperse the particulates may be limited.

Vegetation: The impact of the alternatives on vegetation is determined by the amount of acres managed for different uses. The most profound effects are created by timber management activities. When combined with the elimination of old growth on other ownerships, timber harvest may contribute to a cumulative effect on the regional supply of old growth ecosystems.

Public Issues and concern about dwindling supplies of old growth timber center around three factors. First, there is evidence that large areas of habitat are needed to maintain viable populations of old growth dependent wildlife species, such as spotted owls. Second, structural elements found in old growth forests, such as large decaying logs and multiple canopies, and the ecosystem functions they support, such as nutrient cycling, appear necessary to perpetuate a productive forest system. Finally, unique features of the old growth community may exist which are unknown at this time; the opportunity to study such features would be reduced by harvest of the remaining old growth.

Wildlife: Species which require forage will generally benefit from alternatives which increase timber harvest. Removal of tree cover permits the growth of plants used as food by many species of wildlife. Timber harvest can therefore be beneficial to wildlife by increasing overall vegetative diversity up to the point where cover becomes in short supply for these species. Habitat for species which depend on older vegetation communities will be diminished in these same alternatives. Viable popula-

tions of all species will be maintained in any alternative selected, with the possible exception of Alternative NC.

Aquatic Resources: Effects center around water quality and fish habitat. Fish habitat can be described in terms of aquatic habitat stability, that is, the resistance of habitat to losses in productivity due to disturbances such as floods. A high level of diversity tends to indicate a high level of stability.

Forest management activities involving major modifications of riparian areas or aquatic habitats can impose effects over and above those of natural disturbances such as floods or fires. Timber harvest and road construction may reduce diversity, stability, and water quality. Potential cumulative effects may occur in the White River and Fifteenmile stream systems, due to a combination of Forest timber harvest in the upstream regions and agricultural activities on the downstream private lands.

Fire: Fire occurrence and resource damage will increase under high timber harvest alternatives as a result of increased use of power machinery and burning of slash. The long-term result of high levels of harvest will be young forests with extensive road systems. Such forests are less likely to be damaged by fire due to low fuel loadings and easy access for fire control equipment.

2. Consequences to the Human Environment

Communities: Employment and income will vary mostly in response to timber harvest levels. Changes in harvest from other ownerships may lead to cumulative effects on timber dependent communities in Forest alternatives that reduce harvest from present levels. Development of the Forest for timber management may change recreational use patterns. Effects of the alternatives on livestock and minerals will have insignificant effects on communities.

Alternatives at the ends of the timber production range considered, such as C with the highest ASQ and H with lowest ASQ, will generate considerable controversy as particular local interests receive increasingly less attention. Alternative C will affect lifestyles in the Portland metropolitan area as it gives timber equal priority with water quality in the Bull Run Watershed.

Recreation: Opportunities for developed recreation would not vary by alternative. Dispersed motorized recreation opportunities would increase under alternatives that construct and maintain more roads for timber harvest, but the quality of the natural setting would decline. Opportunities for dispersed nonmotorized recreation would be maintained under alternatives which minimize additional development and close existing roads.

Proposed Wild and Scenic Rivers: All or parts of four rivers have been proposed for designation as Wild, Scenic or Recreational River. Their continuing suitability will depend upon whether they are recommended for such designation in an alternative.

Wilderness: All alternatives will preserve existing wildernesses. Alternative I also recommends the creation of the Olallie Wilderness. The Wilderness environment may be affected in most alternatives by timber harvest in areas adjacent to Wilderness boundaries.

Unroaded Areas: The natural environment of ten remaining unroaded areas will be altered unless included in a management area with standards that prohibit roading. In some cases timber harvest will be planned in unroaded areas, but entry of the areas for this purpose will be deferred until the Forest Plan is revised, 10 to 15 years hence. Such deferment is less feasible in alternatives where timber harvest will initially be greater than long-term sustained-yield capacity.

Special Interest Areas: Special Interest Areas are intended to maintain unusual scenic, historical, archeological, geological, botanical, zoological, or other special features of the Forest. Their use for incompatible purposes in an alternative will reduce or destroy this value. Of existing SIA's, only Olallie would not maintain these features in all alternatives. Additional areas were expressly proposed in some alternatives, benefited from compatible management direction in others and were fully developed for timber management in other alternatives.

Visual Quality: Maintenance of scenic quality varies greatly by alternative. The primary variable is the amount and rate of timber harvested in the more popular viewsheds. This is most critical if the rate is greater than that which should be harvested to perpetuate the existing natural appearing condition.

Cultural Resources: Standards protect the cultural resources of the Forest under all alternatives. The possibility of damage to as yet undiscovered resources will be higher under alternatives with a high level of timber harvest.

Energy: Alternatives with a low timber harvest will use the least energy.

Economic Value: Investments on the Forest in timber harvest and recreation, including the use of fish and wildlife resources produce significant identifiable economic benefits to communities in the influence area. Timber is the only resource generating sizable cash returns to the U.S. Treasury.

3. Short Term Use Versus Long Term Productivity

Even-aged management of timber, which includes clear-cutting, is the only proposed short-term management activity that has the potential to significantly impair long-term resource productivity. However, the National Forest Management Act requires that such harvest systems be carried out in a manner consistent with the protection of soil, watershed, fish, wildlife, recreation, and esthetic resources, and the regeneration of the timber resource. Management standards are designed to ensure these results. Some logging roads, however, could be in place for many years.

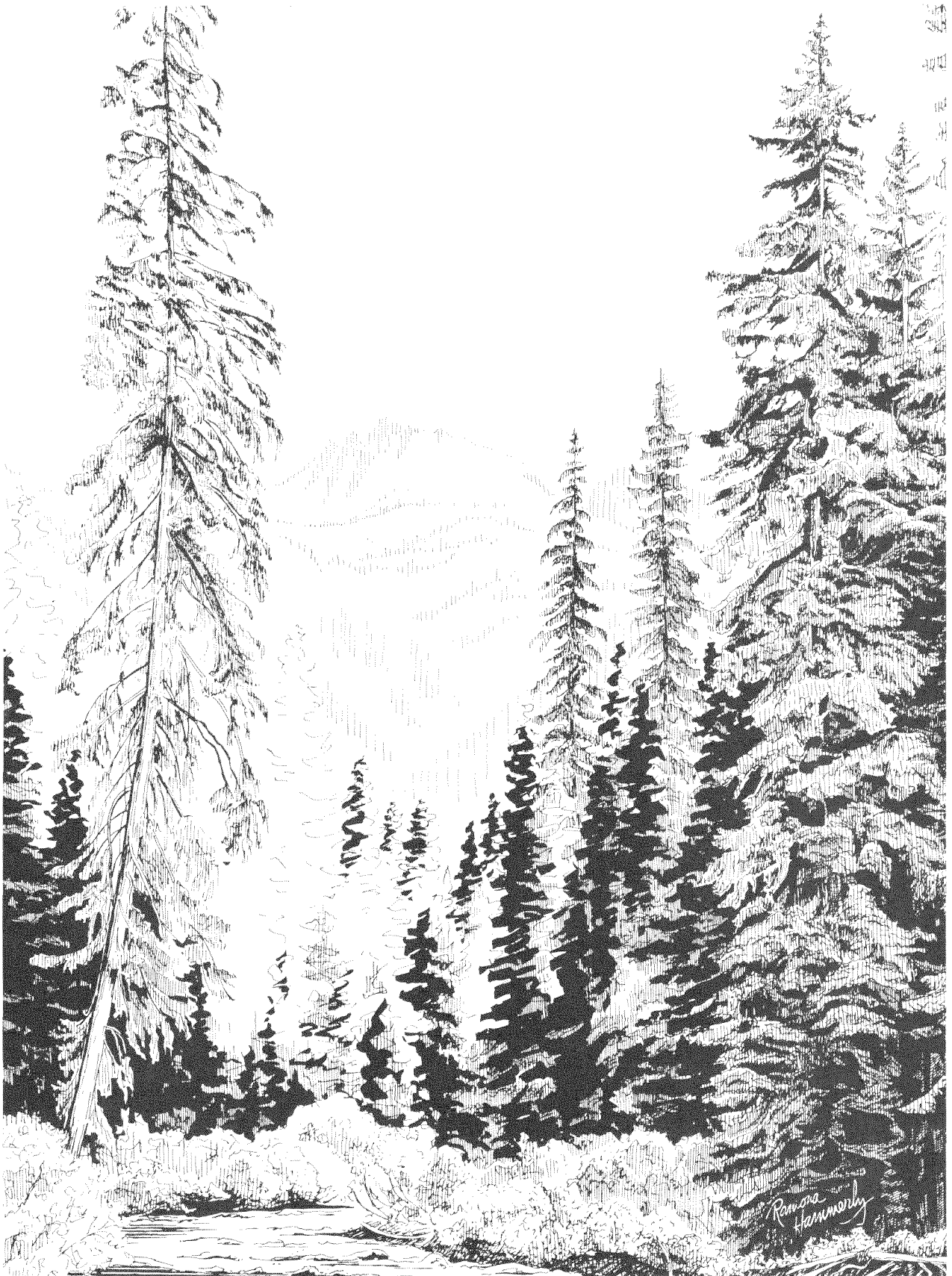
4. Irreversible and Irretrievable Commitment of Resources

Alternative E, the preferred, will result in road construction and timber harvest in unroaded areas, which will effectively eliminate opportunities for semi-primitive non-motorized recreation and future Wilderness designation in such areas. There is a risk that this alternative will also damage archeological sites through timber harvest and road construction, and increase vandalism by providing access. Very old timber that is harvested is irretrievable from a practical standpoint. The preferred alternative will permit extraction of minerals. If these resources are extracted, the commitment will be irreversible.

5. Probable Adverse Impacts Which Cannot Be Avoided

Management of the Forest for commodity production requires some environmental tradeoffs. In addition to the resource commitments mentioned above, the preferred alternative, E, will cause temporary reductions in water and air quality on a localized basis. It will alter the visual landscape for relatively long periods of time. Some communities near the Forest will experience a decrease in employment and income. Fire hazard will temporarily increase in timber sale areas between the time that timber is felled and slash disposal operations are completed.

CHAPTER 1



Chapter I

A. Introduction

Proposed major Federal agency actions which will affect the quality of the human environment require the preparation of an Environmental Impact Statement. This *Draft Environmental Impact Statement (DEIS for short)* for the *Proposed Forest Land and Resource Management Plan (Forest Plan for short)* has been prepared in compliance with that requirement.

Chapter III of the DEIS describes fully the environment affected by the proposed Federal actions discussed in this DEIS.

Public Issues developed at the local, regional, and national levels, along with the professional concerns of the Forest managers, provided decision makers with the detailed information needed to develop alternatives that would respond to the Public Issues that triggered the proposed actions discussed in this DEIS, and to develop management direction for the Forest. Chapter I of the DEIS lists the Public Issues and presents the indicators used to measure how ten alternative plans for the future management of *Mt. Hood National Forest (the Forest for short)*. Each of the ten alternatives presented in Chapter II develops different ways to address the Public Issues. Each of the alternatives generates a different mixture of goods and services which the Forest is capable of producing.

Chapter IV of the DEIS discusses the environmental consequences--or impacts--of the alternatives.

This DEIS complies with the National Environmental Policy Act of 1969 and the Council on Environmental Quality Regulations which require the Forest to identify its preferred alternative which describes the "proposed action." This draft statement also complies with the National Forest Management Act of 1976 and the National Forest System Land and Resource Management Planning Regulations, hereafter shortened to 36 CFR 219.

The alternative in this Environmental Impact Statement identified as the preferred alternative is the basis for the proposed Mt. Hood National Forest Land and Resource Management Plan (the Forest Plan). The proposed Forest Plan is a separate publication, not part of the DEIS. Therefore it should not be read alone, but in combination with the details provided by the DEIS.

As Chapter I will show, the Forest Service is using a lengthy and detailed planning process to guide it in developing the Forest Plan as environmentally sound management direction for the Forest. The purpose of the

Forest Plan is to establish a comprehensive set of management directions which will guide all resource management activities on the Forest. All management actions must comply with Federal law and applicable regulations. Public participation is encouraged throughout the planning process, and comments and suggestions are invited.

Once adopted, the Forest Plan will guide all natural resource management activities and establish management standards for the Forest. This does not mean the Forest Plan has been carved in stone. It will be revised at least every 15 years, and ordinarily on 10-year cycles. The Forest Supervisor will review the Forest's situation at least every 5 years to see if conditions and needs in areas covered by the Forest Plan have undergone significant changes. If the Forest Supervisor's review uncovers important changes, the Forest Plan may be revised accordingly.

Interested persons reading the DEIS and the Draft Forest Plan should bear in mind that these are drafts, not final documents. The DEIS presents step-by-step analysis and development of various ways to respond to public issues and thus allow each person reading the DEIS to determine which alternative plan best meets their needs and desires. Everyone is invited to comment on the findings in the DEIS, and to provide his or her knowledge and information to the Forest Service for consideration. All public comment will be carefully weighed before preparation of the Final Environmental Impact Statement (FEIS for short), and the Final Forest Plan.

B. Purpose and Need

1. Basic Laws and Regulations

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

Following are some of the *applicable laws and regulations*:

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

RPA: Stands for the Forest and Rangeland Renewable Resources Planning Act passed in 1974. This law has two major requirements of interest. First, it requires assessments of the status of the nations' forest and range resour-

ces. Second, it requires the Forest Service to prepare programs for the management and use of those resources.

NFMA: Stands for The National Forest Management Act enacted in 1976. This law amends RPA and requires each of the 123 National Forests to prepare plans for the management of their resources.

40 CFR parts 1500-1508: 40 refers to Title 40 of the Code of Federal Regulations, or CFR. These regulations are sometimes referred to as CEQ regulations. They implement NEPA and give instruction for the development and content of Environmental Impact Statements.

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

Regional Guide Requirements: Additions and clarifications are often added by the Regional Office to supplement national and legal requirements.

With the laws and regulations in mind, the next step is to understand the scope of the Forest Service planning process. It operates on three levels.

National. At this level, RPA programs establish national goals for each resource. Goals are based on estimates of supply and demand. National goals are divided between each of the nine Forest Regions.

Regional. At this level, each Regional Forester develops a Regional Guide. One purpose of a Regional Guide is to distribute the region's shares of the national objectives to the individual National Forests, such as Mt. Hood. Another purpose of a Regional Guide is to establish regional management standards and guidelines. For example, "The Regional Guide for the Pacific Northwest Region," May 1984, provides standards and guidelines used by the Mt. Hood National Forest today. When a Regional Guide is amended or revised, the Forest may also amend or revise its plan in compliance.

Forest. At this level, each National Forest prepares a Forest Plan utilizing site-specific information. Each Forest Plan applies ONLY to the Forest for which it is designed. It is the guiding document for management on the ground.

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

Since allocations in the annual budget have major effects on forest management activities, many of the Forest's goods, services, and environmental effects are ultimately

determined in large part by the annual funding. The annual Forest program planning process and the approved Forest Plan schedules and costs assist in forming an annual program budget that corresponds to congressional appropriations.

2. Ten Planning Steps

Development of this DEIS and the selection of the preferred alternative followed the planning process specified in NFMA implementing regulations and the environmental analysis process and as specified in 36 CFR Part 219.12 and 40 CFR Parts 1500-1508.

The following *ten steps* summarize the activities required to develop the DEIS, the FEIS, and an approved Forest Plan:

Identification of purpose and need. (What are the public issues and how will the Forest measure its response to these issues?)

Development of planning criteria. (What rules apply to data collection, analysis, formulation of alternative plans, and ultimately to decision-making?)

Inventory data and information collection. (What resources and associated ecological communities does the Forest have?)

Analysis of the Management Situation. (What are the capabilities of the Forest? Is there need for changing management direction?)

Formulation of alternatives. (What are different ways of managing the Forest to address the issues?)

Estimation of effects of alternatives. (What changes in the physical, biological, social, and economic environment can be predicted with acceptable accuracy?)

Evaluation of alternatives. (What goods and services would be provided by each alternative? How does each alternative satisfy the public issues identified in Chapter I?)

Identification of preferred alternative. (Is this the best possible management plan under the circumstances?)

Plan approval. (Have all segments of the public had an opportunity to reply?)

Monitoring and evaluation. (Is the Forest meeting its planned objectives, and do all activities comply with the direction established by the Plan?)

This DEIS presents the results of the environmental analysis obtained by completing the first eight of the ten planning steps. Please refer to Appendix B for analyses associated with the ten planning steps. The next step is to provide essential information to public officials and concerned citizens before making final decisions and taking actions to implement them.

3. Planning Records

All documents and files which chronicle the planning process of the Mt. Hood National Forest are maintained at the Forest Supervisor's Office, 2955 N.W. Division Street, Gresham, Oregon 97030 for review by interested persons. These documents and files (or "planning records") contain the environmental analysis and other detailed information used in developing this DEIS and the Draft Forest Plan. Readers will find the planning records incorporated by reference at pertinent points in the text and appendices. Once this DEIS and Draft Forest Plan have been released for public review and comment, the Regional Forester, who is the responsible official, will use all information provided by the DEIS and the public responses to reach a decision. Data in support of this decision will be incorporated into a "Record of Decision" available to the public.

4. Tiering Environmental Assessments

After the Forest Plan is approved, projects will be proposed which require the preparation of Environmental Assessments. These Assessments will focus on issues which apply only to the project in question. Therefore the assessments will not repeat information contained in the DEIS and associated documents, but will refer to applicable provisions of those documents. The process of referring to the DEIS is called "tiering."

5. Previous Plans

The Forest Plan, upon approval, will supersede or incorporate all existing land and resource management plans of the Forest. Table I-1 on the following two pages lists these plans and shows which will continue, be revised or terminated. Appropriated budgets, contracts and other instruments governing the use and occupancy of National Forest Lands must comply with all provisions of the Forest Plan, and some plans now in effect meet current law and regulations. Management direction in these plans may be incorporated without modifications into the Forest Plan (CFR 219.2(b)).

The Bull Run Watershed Management Unit Plan is an example of a plan being followed in compliance with public law. The management objectives for the Bull Run Watershed are mandated by Public Law 95-200. Following passage of this law, the Forest completed the Bull Run Unit Plan in 1979. The Bull Run Unit Plan's management direction has been incorporated into all DEIS alternatives but one, Alternative C.

Table I-1

Status of existing plans under the Forest Land and Resource Management Plan (Forest Plan)

PLANS TO BE CONTINUED AS IS	PLANS TO BE CONTINUED WITH REVISIONS	PLANS TO BE SUPERCEDED
RECREATION PLANS		
Columbia Gorge Outreach	Timothy Lake Area	Eagle Creek Limited Area
Timberline Interpretative	Off-Road Vehicles Visitor Information Service	
SKI AREA MASTER PLANS		
Mt. Hood Meadows Ski Area FEIS for future development Timberline Lodge FEIS	Multopor (Mirror Mountain) Ski Bowl	
SPECIAL INTEREST & UNUSUAL INTEREST AREA PLANS		
	Bagby Hot Springs Geological Area Little Crater Lake Geologic Area Ollalie Lake Scenic Area Parkdale Lava Beds Unusual Interest Area Sugar Pine Unusual Interest Area	Bull of the Woods Scenic Area
HISTORIC AREA PLANS		
Clackamas Lake Ranger Station Historic Site Mgmt.	Col. Gorge "Old" Wagon Road Barlow Tollgate Historic Area Barlow Road Management	Cloud Cap Inn Unusual Interest Area
RECREATION TRAIL PLANS		
Pacific Crest National Scenic Trail	District Trail Development Management (one per Dist.)	
PLANNING UNIT PLANS		
Bull Run FEIS	Mt. Hood Community Mt. Hood Corridor	Clackamas Huckleberry EIS Badger-Jordan Dalles Municipal Watershed Roaring River/ Salmon River EIS Eagle Creek Watershed
DISTRICT MULTIPLE USE PLANS		
		All Districts'
RANGE ALLOTMENT PLANS		
Long Prairie White River Wapinitia Horsetail Clackamas Badger & Grasshopper Coordinated Resource Plans	Roaring River	
RESOURCE PLANS		
Forest Noxious Weed Ownership Adjustment Bagby Research Natural Area	Rock Resource Geothermal Leasing Analysis Road Maintenance	
TIMBER PLANS		
	Tree Improvement Program	Forest TM Plan
FIRE MANAGEMENT PLANS		
Forest Aviation	Fire Mgmt. Implementation	

C. Forest Highlights and Resources

1. Background

This part of Chapter I is intended to focus on the distinctive characteristics of the Forest rather than attempt to describe this enormous tract of land in detail. For a more complete description, please see Chapter III. That chapter also provides references and additional sources of information.

The Forest is directly east of the City of Portland and bounded on the north by the Columbia River, which also divides Oregon and Washington. Most of the Forest lies in Multnomah, Clackamas, Hood River, and Wasco counties. A small portion adjacent to the Willamette National Forest is in Marion and Jefferson counties. The Warm Springs Indian Reservation is located just outside the southeast border of the Forest. The lands of the Forest total more than one million acres, with the largest acreage on the west side of the Cascade Mountain Range, and the smaller part on the east side. The Forest is divided into seven Ranger Districts as shown by the boundaries and headquarters.

Map I-1 shows the location of the Mt. Hood National Forest with regard to the United States and the Pacific Northwest Region. Forest lands exceed one million acres, an area larger than some states. Approximately 40% of all Oregon residents, plus numerous industries, rely on Forest aquatic resources for their water.

The Forest's origins trace to 1892 with the formation of the Bull Run Forest Reserve when the City of Portland became concerned about its water situation and sought a way, with Federal legislation, to assure an ample flow. Congress created The Bull Run Forest Reserve to meet the City's needs, and the Bull Run has supplied pure water to Portland ever since. The Cascade Range Forest Reserve was created by Congress shortly after in 1893.

In 1908 the Bull Run Forest Reserve was combined with the northern portion of the Cascade Range Forest Reserve and renamed The Oregon National Forest. In 1924, that Forest was renamed Mt. Hood National Forest.

By 1915, Portlanders were pressing to make Mount Hood a national park. Through the years, the area's population grew, and new and better highways made Mount Hood and the Columbia Gorge increasingly accessible. In response to public demand, recreation on the Forest received special emphasis in the early part of this century when the Secretary of Agriculture designated, through an Executive Land classification order, the Mt. Hood Recreation Area and the Columbia Gorge Park Division of The Oregon National Forest. This order directed that the administration and use of the areas be for preservation of the scenic

beauty and for recreation use and public enjoyment, coordinately with the purposes for which the Oregon National Forest was established. Under current management, both of these areas receive special emphasis for recreation use, within the current limited recreation budgets.

2. Social and Economic Aspects

The Portland Metropolitan Area, with a 1985 population estimated at 1.1 million people, exerts the most significant social and economic influences on the Forest. The area has a diverse economy and has experienced an above-average growth. Living only 50 miles from the Forest, most of Portland's residents can reach the Forest's more accessible areas in less than an hour's drive.

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

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

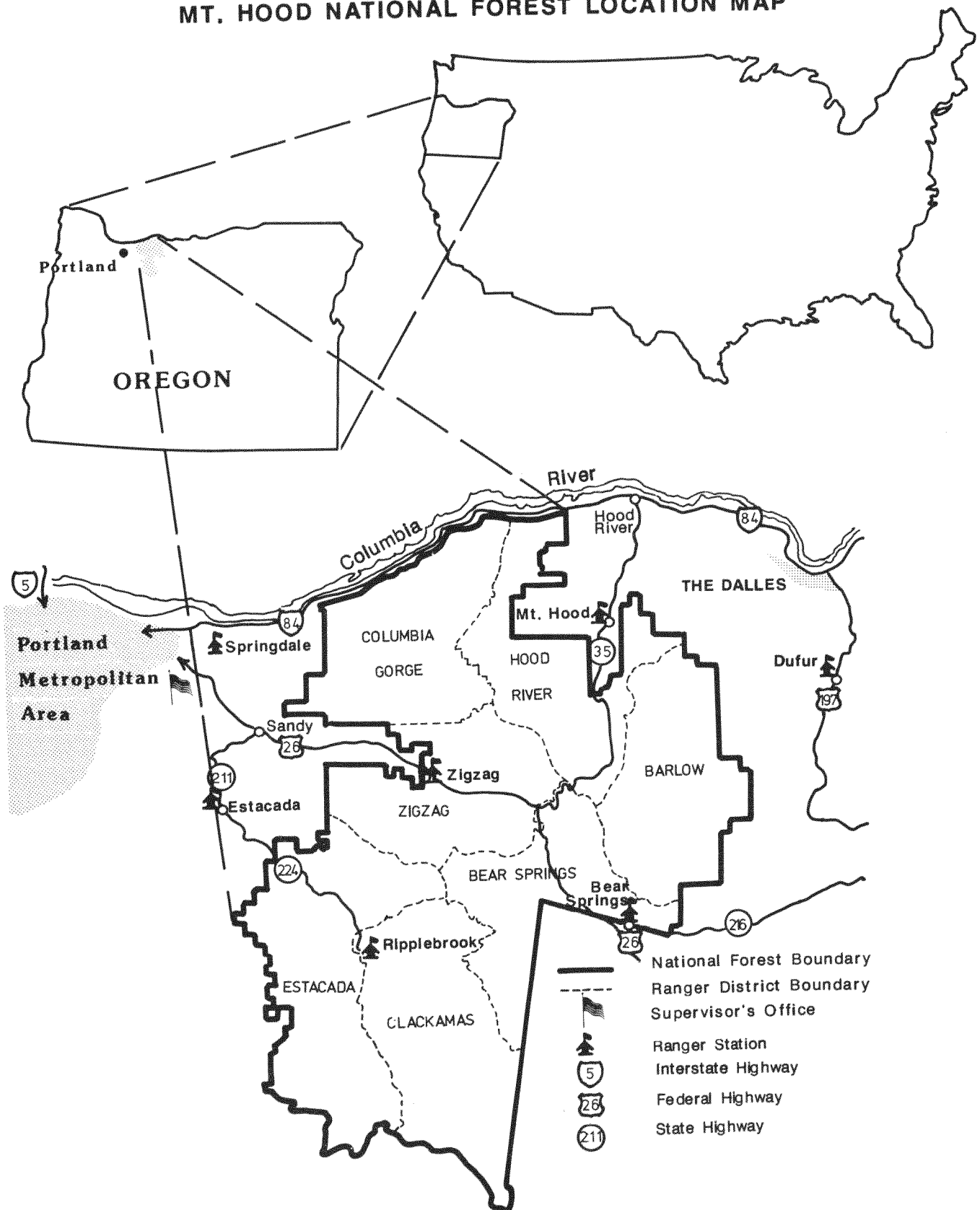
In contrast to the urbanized counties on the west side of the Forest, counties on the east are sparsely populated and rural. Current estimates place the population of Hood River and Wasco Counties on the east side of the Cascade Crest at less than 40,000, which is a little more than 4% of the total nearby population. Orchards abound in Hood River Valley. Ranching, farming, and timber are mainstays of the economy of Wasco County. Timber is a major factor in the economies of several small westside communities close to the Forest.

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

3. Physical and Biological Features

It is impossible to consider the Forest without looking at its parts. It varies from flower-decked meadowlands to trees so huge and tall sunshine barely penetrates to the

MT. HOOD NATIONAL FOREST LOCATION MAP



forest floor. In the Columbia Gorge, waterfalls plunge a hundred feet or more, while glacial lakes above the timberline lie deep and still.

Above it all towers majestic Mount Hood, named by Lt. William Robert Broughton in 1792 after Samuel Hood, a British Rear Admiral and one of the explorers of the region. This giant mountain, more than two miles high, never loses its cap of snow which often hides in the region's morning clouds. One of the many volcanoes in the Cascade Mountain range, Mount Hood at 11,235 feet is the tallest peak in Oregon, and one of the tallest in the Northwest.

Huge expanses of the Forest, especially on the west side, are rugged. The Pacific side of the Forest is virtually a different climatic and biological world compared to the east side. Prevailing westerly winds from the Pacific Ocean bring moisture to the west side that falls as rain in lower areas and usually as snow at higher elevations. The climate of the west side's lower areas is therefore mild and wet. Reflecting the climate, plant life on the west side is dominated by Douglas-fir trees in dense, cathedral-like stands of old growth, or in open stands carpeted with colorful flowers. The alpine meadows in higher elevations are covered in warm weather with spectacular displays of wildflowers.

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

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

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

4. Resources

About one-third of the Forest's extensive stands of timber consists of very large trees two hundred or more years old. In addition to the obvious supply of timber, the Forest contains such other resources as water, fish, wildlife, un-

developed and developed recreation facilities, and extraordinary scenery. These resources offer a wide range of opportunities and benefits to people in all walks of life.

The production of timber is an important function of the Forest, and is especially important to many smaller communities close to the Forest. People in nearby towns depend on the sawmills to provide them with employment. Refer to Table III-14 in Chapter III for an indication of the broad relationships of work force and payroll in metropolitan counties influenced by Forest resources and activities. Timber, before it is cut, is vital to the ecology of the forest, as it provides habitats for wildlife and wilderness experiences for human visitors.

Recreational opportunities for people visiting the Forest range from downhill or cross-country skiing to wilderness hiking, or just contemplating pristine nature. Both the mountain climber and the sightseer can find in the Forest many personal forms of relaxation and renewal. People living in heavily-populated metropolitan Portland have found the recreational resources of the Forest to be a major contribution toward the high livability of the City.

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

Within the Forest itself, many streams and lakes are habitats for a variety of fish. The most important of these are trout and the famous northwest salmon, an "anadromous" species. Anadromous fish spawn in fresh water and grow to maturity in salt water. Their life cycle makes them highly sensitive to changes in water conditions. People of the northwest are also sensitive about conditions that affect the quantity and quality of anadromous fish.

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

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

D. Public Issues

1. The Effects of Public Issues on Forest Planning

Different people and different groups of people look upon the resources of Mt. Hood National Forest in the light of their individual interests. Therefore they would like to see the Forest managed in ways that satisfy such interests. This is understandable. But it also raises conflicting public issues.

A public issue is defined as follows:

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

Experience shows that planning components can be expressed in terms of public issues.

Since the planning process is guided by public issues, a fundamental step is identification of the relevant public issues. Finding answers to that question led to an extensive and continuing process utilizing public meetings, newsletters, correspondence, and local news media. It included direct, personal contacts by Forest Service personnel. It incorporated comments and suggestions from a wide cross section of individuals and groups, both public and private, such as adjacent landowners, adjacent National Forests, agencies of State and local governments, local employers, conservation organizations, and Native Americans.

The extent of this process is suggested by the length of time involved. The Mt. Hood planning process began more than eight years ago when the *Forest Interdisciplinary Planning Team (IDT)* drew up a preliminary set of public issues.

This first effort was based on information gathered in earlier planning process and from "brainstorming" sessions conducted by Forest officials. Documents that incorporated this first set of public issues were sent to all known interested persons and groups asking for comments.

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

Following the 1980 approval, the process of identifying and assembling final public issues continued through periodic meetings and discussions with groups and individuals over the intervening years. Some issues were modified as a result of these reviews, along with changes in policies and required procedures, and a final set of public issues was prepared. The Regional Forester reviewed this set of public issues, and approved them in September 1984. All public issues discussed in this DEIS are therefore current.

They have been used as a guide throughout the design and analysis of all alternatives described in this document. They were also used as the criteria to identify the "preferred alternative," and to insure that the resulting Land and Resource Management Plan will provide appropriate and effective management direction for the Forest.

Those interested in reading how the public issues used in this planning process were collected, sorted, analyzed, assembled, arranged, and rearranged will find, in Appendix A of this DEIS, complete details along with rationale presented by the various publics for each issue.

The remainder of this chapter will identify the current list of public issues, display the relationships between issues, and identify how the the planning responses to the various issues will be measured.

2. List of Public Issues

The fifteen individual Public Issues listed below were identified through the process described above and in Appendix A of this DEIS.

- #1. Use of Chemicals in the Management of Forest Vegetation.
- #2. Level of Timber Supply on the Mt. Hood National Forest.
- #3. Economics of the Timber Sale Program.
- #4. Location, Density, Design, and Standards of Forest Roads.
- #5. Forest users have reached or exceeded the capacity of existing public highways in or near the Mt. Hood Forest during heavy use periods.
- #6. Maintenance and Distribution of Old Growth.
- #7. Viable populations of spotted owls and management indicator species.
- #8. Conflicts Between Management Activities and Competing Recreational Activities.
- #9. Maintenance and Enhancement of Scenic Quality.
- #10. Level of Ski Area Development.
- #11. Allocation of the Remaining Roadless Areas.
- #12. Community stability and livability.
- #13. Maintenance of Anadromous and Resident Fish Habitat.
- #14. Rehabilitation and Enhancement of Fish Habitat, particularly for Anadromous Species.
- #15. Diminishing supply, or availability, of resources traditionally used in Indian Religious and Cultural Life.

3. Relationships Between Public Issues

Even a casual glance at the Public Issues listed above will show the virtual impossibility of dealing with them as separate issues. Most of the fifteen Public Issues listed above are related to some degree. Since management activities that affect one resource will usually affect a number of other resources, we have grouped those Public Issues that are most closely related. These groups are arranged so they can be logically addressed by the alternatives. As the emphasis of an alternative differs, a given group of Public Issues are addressed in different ways.

The groups of Public Issues are:

- Level of Timber Supply and Wood Fiber.
- Maintenance and Enhancement of Fish Habitat and Water Quality.
- Maintenance and Enhancement of the Quality and Quantity of Old Growth and Other Suitable Wildlife Habitat.
- Maintenance and Enhancement of Wilderness, Outdoor Recreation Resources and Scenic Quality of the Forest in Response to the needs of an Increasing Nearby Metropolitan Population.
- Disposition of the Remaining Unroaded Areas.
- Community Dependence on Forest Resources.

E. Public Issue Groups

Following is a discussion of each of these Public Issue groups. The public's stand or reason for each issue group is presented, followed by a presentation of the indicators used to measure how well the alternatives developed in Chapter II respond to each issue group.

Public Issue Group 1:

Level of Timber Supply and Wood Fiber Production

1. Issue Statements

This Public Issue Group includes the following issue statements:

- Use of chemicals in the management of Forest vegetation.

This issue has been raised by environmental groups, such as the Oregon Wilderness Coalition, the Northwest Coalition for Alternatives to Pesticides, the Oregon Environmental Council, the Audubon Society, and individuals concerned about health and ecological effects that could result from the use of chemicals, including fertilizers, pesticides and herbicides, in the Forest environment for "brush" and forest pest control.

- Level of timber supply on the Mt. Hood National Forest.

Between now and the year 2010, the supply of timber from private lands is expected to decline. The State of Oregon and the Northwest Timber Association feel that the Mt. Hood National Forest should help fill the supply gap until the private lands reach rotation age. The State's "Forestry Program for Oregon" calls for the Mt. Hood National Forest to produce 111.3 cubic feet/year (approximately 565 million board feet).

The Oregon Wilderness Coalition has strongly stated their stand that "the National Forests were not reserved to bail out the private timber companies after they have overcut their own lands." The Coalition is also asking for higher standards on what is classified as suitable timber growing land base.

The Industrial Forestry Association has taken the stand that the goal of the Mt. Hood National Forest's timber harvest schedule should be to meet the Nation's demand for wood products, to attempt to meet the rising demand for wood products, and to minimize the inflationary impacts of rising wood prices. A major concern of this association is having a consistent supply of timber.



The Forest is a major supplier of timber.

The Northwest Timber Association (formerly the Industrial Forestry Association) has identified timber supply as the most important single issue in western Oregon. A major concern of this organization is that managing the Forest for resources other than timber could reduce wood fiber production to the point that the forest products industry and community stability would suffer. As a result, this organization's industry representatives insist on the highest possible level of timber production from the Mt. Hood National Forest.



Lumber production is an important source of employment in communities near the Forest.

- Maintenance of anadromous and resident fish habitat.

The Mt. Hood Forest Study Group and the Oregon Department of Fish and Wildlife have raised the issue that timber harvesting in and near riparian areas will adversely affect wildlife and recreation values, lake productivity, stream bank stability, fish production, and water quality.

The Oregon Department of Fish and Wildlife has stated that the Mt. Hood National Forest should constrain timber harvest or withdraw from timber harvest and grazing sufficient riparian habitat to maintain or improve water quality and fish and wildlife habitat values.

- Maintenance and distribution of old growth.

The Oregon Department of Fish and Wildlife has raised an issue about scheduling of timber harvest programs, particularly about the rate and extent to which stands of mature and old growth forests are converted to younger age stands. The issue is about the maintenance of necessary habitat conditions and proper cover/forage ratios for wildlife, including non-game species.

The National Wildlife Federation feels strongly that intensive timber practices impair the Forest's wildlife habitat.

- Economics of the timber sale program.

The National Wildlife Federation and Cascade Holistic Economic Consultants (CHEC) have raised the issue that the Mt. Hood National Forest should not be investing taxpayers dollars in timber management where the benefits do not outweigh the costs.

Environmental groups have made an issue of "below cost sales" and "deficit sales" and are concerned that these types of sales are subsidizing the timber industry.

- Location, density, design and standards of Forest roads.

The Oregon Wilderness Coalition has raised an issue about the disparity of trail miles compared to road miles on the National Forests and are asking that the Forest Service consider a multitude of road standards based on costs and purposes for roads. They are also asking for consideration of road closures and road rehabilitation to benefit soil, water, fish, wildlife, and recreation.

The Oregon Environmental Council has often made an issue of undesirable cumulative effects of road building and use of tracked or wheeled vehicles in the Forest on land stability, harmful land movements and erosion.

- Allocation of remaining roadless areas.

The Sierra Club, Northwest Office, and the Mt. Hood Forest Study Group have urged that the many amenity benefits of roadless areas be recognized and that areas be maintained.

The groups have also stated they believe that the tree improvement program would be strengthened by the preservation of natural gene pools within Wilderness.

2. Indicators of Responsiveness

The following *indicators of responsiveness* to Public Issue Group 1, dealing with timber supply, will be evaluated in each alternative:

- Average Annual, First Decade Allowable Sale Quantity (ASQ), millions of board feet of green merchantable timber offered each year during the first decade.
- Timber Sale Program Quantity (TSPQ), total board feet of timber offered the first decade, including salvage, other saw timber, and other volumes of wood offered, such as firewood.
- The Long-Term Sustained Yield Capacity (LTSYC), the capacity of the Forest to produce green merchantable volume in perpetuity; (reported in million cubic feet per decade).

Explanation of Indicators

The TSPQ is used as an indicator of timber supply and is used by local timber purchasers and national planning processes to project timber supplied by the Forest. The ASQ consists of volume which is scheduled to be harvested (chargeable) plus volume which is not scheduled for harvest (nonchargeable). Salvage is that portion of the nonchargeable volume which is obtained due to storm, insect, disease, fire, etc.

The ability of the Forest to produce timber over the long run is also important information. The LTSYC of the

Forest to produce timber varies by alternative and is directly affected by the amount of land devoted to growing trees for harvest.

Public Issue Group 2:

Maintenance and Enhancement of Fish Habitat and Water Quality

1. Issue Statements

This Public Issue group includes the following issue statements:

- Use of chemicals in the management of Forest vegetation.

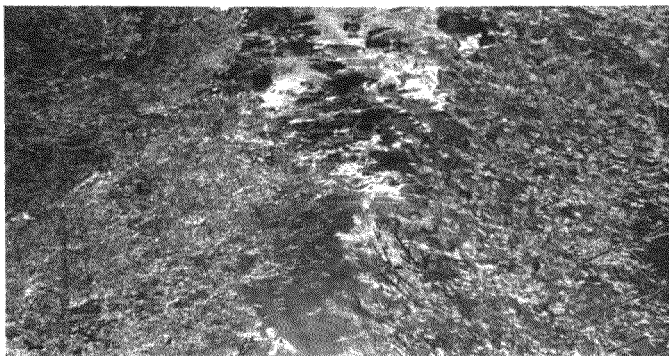
Environmental groups have raised the issue that chemicals used in the management of Forest vegetation may enter streams, lakes, and other riparian areas and adversely affect water quality and aquatic habitat.

- Maintenance of anadromous and resident fish habitat and water quality.

The Oregon Wilderness Coalition has stated the Forest Service should make maintenance of existing fish habitat and the restoration of lost fish habitat top priorities. They also consider the management of resident fish habitat and riparian zone management to be an issue. This group believes that nonstatutory municipal watersheds on the Forest should not have programmed timber cutting, and protection of the water supply should be the dominant use of the allowed multiple uses.

Preservation of water quality is an important issue of many residents near the Forest, as well as many of those who use the Forest for recreation or irrigation. A very large number of people depend on water flowing from the Forest's watersheds. The Columbia River Inter-Tribal Fish Commission has a great interest in preserving water quality and watershed stability.

The Mt. Hood Forest Study Group and the Mazamas have raised the issue that riparian areas need protection from timber harvest, road building and other intrusions in order to preserve wildlife values, protect stream bank stability and insure fish production.



Riparian areas have timber, wildlife, fish, and water quality values.

Timber industry interests view the timber growing within riparian areas as an important part of the timber supply and generally oppose restricted timber harvest within riparian areas.

The Northwest Office and the Columbia Group of the Sierra Club and the Mt. Hood Forest Study Group have identified protection and enhancement of fish habitat and fish production as one of their major issues on the Forest. The Columbia River Inter-Tribal Fish Commission and the Sierra Club have stated that they believe the Forest Service has statutory obligations to maintain and to enhance anadromous fish populations, and that fish production targets for natural resident and anadromous fish should be established and that habitat goals should be based on these targets.

- Location, design, and standards of Forest roads.

The Mt. Hood Forest Study Group and the Oregon Department of Fish and Wildlife are concerned that road building resulting from timber harvesting in and near riparian areas will restrict fish passage and impact riparian areas.

- Rehabilitation and enhancement of fish habitat, especially for anadromous fish.

Demands for maintenance and enhancement of fish habitat and water quality have steadily increased in the last decade. In addition to State legislation, recent Federal legislation such as the Northwest Power Planning and Conservation Act, has called for increased protection of water from competing uses like hydropower development, forest management activities, and agricultural practices.

The regional demand for anadromous fish far exceeds the current supply. As a consequence, a major issue with the Oregon Department of Fish and Wildlife and the Columbia River Inter-Tribal Fish Commission concerns methods to increase anadromous fish production, especially the anadromous stocks of the Columbia River basin.

The Sierra Club and the Oregon Department of Fish and Wildlife state that, even given the current dams in place, the level of production of the Mt. Hood National Forest fishery for salmon and steelhead is substantially below potential. They have stated that the production levels of the Mt. Hood Forest fishery being below potential is an important issue.

These groups above and Trout Unlimited, as well as many individuals, feel the Forest should increase and enhance fish habitat, including habitat for wild trout, in order to achieve substantial increases in the production of fish.

2. Indicators of Responsiveness

The following *indicators of responsiveness* to Public Issue Group 2, dealing with fish habitat and water quality, will be evaluated in each alternative:

a. Aquatic Habitat Stability Index. The index is based on the Forest's capability to provide aquatic habitat, 10 to 20 years after Forest Plan Implementation. It is based on a scale of 1 to 10, with 10 as the highest rating.

b. Acres explicitly managed to meet riparian objectives, i.e. Bull Run Watershed, Key Site Riparian Areas, General Riparian Areas, and Special Emphasis Watersheds.

Explanation of Indicators

Aquatic habitats react to changing land conditions. The condition of the aquatic resource reflects the cumulative effects of a wide variety of management activities. As the condition of the aquatic habitat is changed, so changes the numbers of species that survive. The condition of aquatic habitats may be estimated from sediment indices, reflected as a habitat suitability rating. The amount of land area specifically identified and allocated to management of aquatic resources is also a good measure of overall aquatic habitat quality and the capability to maintain high quality conditions.

Public Issue Group 3:

Maintenance and Enhancement of the Quality and Quantity of Old Growth and other Suitable Wildlife Habitat

1. Issue Statements

This Public Issue group includes the following issue statements:

- Level of timber supply on the Mt. Hood National Forest.

The Oregon Wilderness Coalition has raised as an issue the need to resolve the continuing loss of wildlife habitat due to range and timber management activities.

The Mazamas have stated they support multiple use of the Forest with a balance between the many users. However they have stated that timber is the biggest area of conflict. The issue is that some of the highly productive timber sites need to be preserved to provide suitable habitat for dependent plants and animals. Consideration for both game and nongame wildlife is also an issue with this organization. The Sierra Club insists the Forest must be managed in compliance with laws and regulations which require it to provide adequate habitat to maintain viable populations of wildlife. The issue is the sharp difference in opinion on how much habitat should be allocated to maintain viable populations of wildlife. Environmental groups such as the Audubon Society, feel that considerably more acres of habitat are necessary than do timber industry groups such as the Northwest Timber Association.

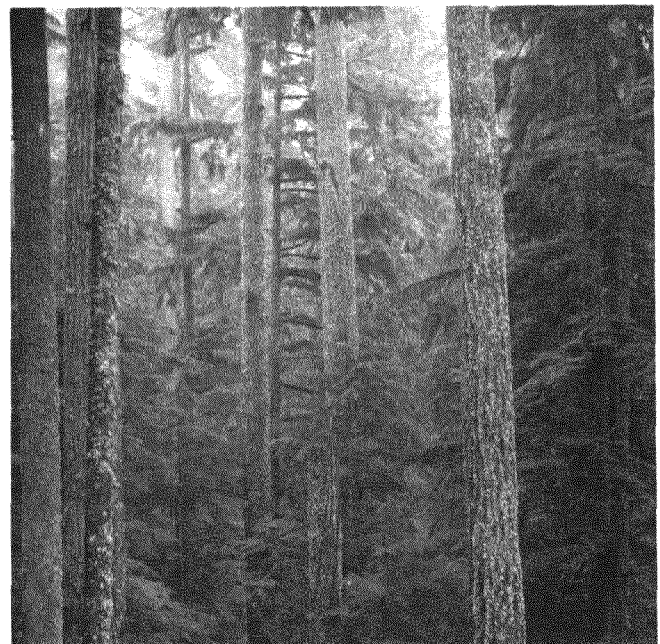
- Location, density, design and standards of Forest roads.

The National Wildlife Federation feels increased roading will increase harassment of wildlife and impair wildlife movement.

Sporting groups feel a high density of roads may adversely affect hunting quality. These groups have also voiced as an issue the need for road closures and construction of fewer roads.

- Maintenance and distribution of old growth.

Some environmental groups believe old growth forests are rapidly declining. The issue is that they believe old growth forests are needed in sufficient size and distribution to sustain viable populations of dependent plants and animals. Other groups such as the Audubon Society are discussing the importance of old growth as ecological communities for many species.



Old growth provides wildlife habitat.

The Associated Oregon Loggers, Inc. and other timber industry groups are not willing to accept reductions in timber harvest caused by retaining lands in timber as wildlife habitat. This applies especially to stands of "old growth."

Some environmental groups, such as Earth First!, Cathedral Forest Action Group, and many individuals highly value wildlife found in old growth forests. The issue is that with continued timber harvesting these values will be lost.

- Viable populations of spotted owls and management indicator species.

This public issue concerns the amount and management of habitat for sensitive animal and plant species, identified "indicator species," and any potentially threatened or endangered species. The Oregon Wilderness Coalition has urged the Forest Service to recognize "diminishing

species" and to develop better inventories of wildlife species as is done for timber.

The Oregon Department of Fish and Wildlife has raised the issue that the Forest protects habitat in compliance with the Interagency Spotted Owl Management Plan and insures adequate monitoring of owl habitat.

The Audubon Society has an issue over whether sufficient areas of appropriate wildlife habitat are being provided on the Forest, and are questioning what is a minimum viable population.

The Oregon Wilderness Coalition has raised ecological diversity on the National Forest System as an issue and a requirement of law. The Oregon Department of Fish and Wildlife (ODFW) is also concerned about habitat diversity on the Forest to meet ODFW objectives for all species of wildlife. This issue is related to the one on riparian-dependent resources because wildlife and riparian areas often overlap.

Cascade Holistic Economic Consultants (CHEC) has raised the issue that the Forest Service must maintain diversity of plant and animal communities and tree species similar to natural diversity in all parts of the Forest and that management must change if natural diversity is not maintained. Also, the Forest Service must maintain existing natural plant communities and successional stages by allocating land specifically for the purpose of maintaining diversity.

- Allocation of remaining unroaded areas.

The Northwest Office of the Sierra Club and the Mt. Hood Forest Study Group have raised the issue that the maintenance of the present scenic, special interest, and roadless areas of the Forest in a natural state is essential to enhancing habitat of sensitive plant and wildlife species. They also believe the areas are essential for the eventual perpetuation of wildlife populations. They think the tree improvement program would be strengthened by the preservation of natural gene pools within Wilderness and natural areas.

- Maintenance of anadromous and resident fish habitat.

The Mt. Hood Forest Study Group urges that old growth areas be retained to aid in maintaining riparian habitat.

- Conflicts between management activities and competing recreational activities.

Environmental groups, such as Earth First!, Cathedral Forest Action Group, and numerous individuals highly value the recreational, scenic and aesthetic values found in old growth forests. Their issue is that with continued timber harvesting these opportunities will be lost. These groups insist that old growth forests are highly desirable for recreation, tourism, scenery and other aesthetic values.

2. Indicators of Responsiveness

The following *indicators of responsiveness* to the issues involved in Public Issue Group 3, dealing with wildlife habitat, will be evaluated in each alternative:

- a. Acres of old growth remaining after 50 years. Gross acres of trees at least 200 years old, 50 years after implementation.
- b. Acres of young growth available after 50 years. Gross acres of trees less than, or equal to, 20 years old, 50 years after implementation of plan.

Explanation of Indicators

Wildlife populations are tied directly to the amount of available habitat, condition, and management of habitat. As habitats approach optimum, the variety and numbers of wildlife change in keeping with the amount and types of habitat available. As habitat conditions deteriorate due to other management activities, wildlife populations change in numbers and viability. Acres of suitable old and young growth habitat identified for management of specific species act as indicators of wildlife conditions, particularly for big game species, wildlife species dependent on over mature timber types, and for nongame species found primarily in young timber.

Public Issue Group 4:

Maintenance and Enhancement of Wilderness, Wild and Scenic Rivers, Outdoor Recreation Resources and Scenic Quality of the Forest in Response to the needs of an Increasing Nearby Metropolitan Population

1. Issue Statements

This Public Issue group includes the following issue statements:

- Level of timber supply on the Mt. Hood National Forest.

The issue with the members of the Oregon Environmental Council is that the amount of Forest land removed from the timber base for unroaded recreation and scenic quality is insufficient.

An issue with the Northwest Timber Association is how much timber will be available for harvest after meeting recreation concerns.

- Location, density, design, and standards of Forest roads.

Closing spur roads after logging and having more main line roads paved are issues with the Mazamas.

Environmental and outdoor groups have raised an issue that the Forest transportation system provide recreational parking at road junctions, or other areas, where there is winter use or trail parking needs.

- Forest users have reached or exceeded the capacity of existing public highways in or near the Forest during heavy use periods.

This issue was brought out and extensively discussed in a study of the situation conducted jointly by the Forest Service, the Oregon Dept. of Transportation, and the Federal Highway Administration. The study disclosed that the use of Highway 26 across the Forest often exceeded its capacity during the ski season creating especially severe congestion on U.S. Highway 26. Expansion of existing ski resorts or other winter recreation facilities under Forest Service administration could make this problem worse if management of winter sports is not coordinated with steps to reduce the congestion.

- Maintenance and Distribution of Old Growth.

Environmental groups, such as Earth First!, Cathedral Forest Action Group, and numerous individuals highly value the recreational, scenic and aesthetic benefits found in old growth forests. The issue is that with continued timber harvesting these opportunities will be lost. These groups insist that old growth forests are highly desirable for recreation, tourism, scenery, and other aesthetic values.

- Conflicts between management activities and competing recreation activities.

The Mazamas have stated the issue is that "harvesting needs to be based on the economically allowable harvest base and that much more of the Forest land base needs to be placed in recreational, scenic, roadless, Wild Rivers, and Wilderness classifications."

The amount of Forest land that is removed from the commercial timber base for unroaded recreation and scenic quality is insufficient according to an issue expressed by members of the Oregon Environmental Council. Associated issues expressed by the Council are the loss of scenic quality in a number of travel corridors from timber cutting treatments, harvest levels, and cutting practices in riparian areas.

The Northwest Office of the Sierra Club and the Mt. Hood Forest Study Group have stated they believe the maintenance of the present scenic, special interest, and roadless areas of the Forest in a natural state is essential to continuation of diverse recreation opportunities on the Forest. The Oregon Wilderness Coalition has stated that the Wilderness issue is still an issue with their group and have urged the designation of additional special interest areas.

Conflicts between the various types of winter users are increasing. The Nordic Ski Club and other ski groups and individuals do not favor the use of roads in winter snow zones by four-wheel drive enthusiasts. At issue with these groups is that available winter parking and trails for cross country skiing do not meet the current needs and are overcrowded most winter days. These groups are asking for more winter parking, more winter trails and adequate administration of winter recreation use.

The Oregon Wilderness Coalition has raised the management and disposition of recreation trails on the Forest as an issue of concern to them and has urged the Forest Service to coordinate their trail system plans with those of the State.

Prior to the 1960's, the Mt. Hood National Forest had an extensive network of trails. An issue with the Mazamas, the State of Oregon, the Obsidians and other hiking groups and individuals is that they would like to see more emphasis placed on restoring trails lost through timber harvesting and road building. They also have made an issue of the fact that the only remaining trails are concentrated in existing scenic areas or Wilderness, and that many remaining trails are deteriorating due to heavy use and lack of maintenance.

The American Motorcyclist Association has gone on record requesting Forest Service support for providing opportunities for their 130,000 active members to use motorcycles on Forest land. They have stated that "correct management" is taking into account the nature and effects of motorcycle use and taking the minimum steps necessary to halt adverse effects on the land.

- Maintenance and enhancement of scenic quality.

The Audubon Society has requested that the Forest protect major road corridors, and scenic and recreational areas from the "visual blight" of clearcuts.

The Sierra Club and the Mt. Hood Forest Study Group have made an issue of their belief that the Forest should be managed for the best uses of its diverse recreation resources, and that the need to maintain the land's natural beauty cannot be neglected. The Oregon Environmental Council has stated their issue with the effect of management activities on scenic quality in travel corridors and other scenic areas of the Forest. At issue are management activities, including timber harvest, which affect scenic values because much of the Forest is clearly visible from the various roads and highway loops traversing the Forest.



Scenic quality is a factor in Forest Management.

The Oregon Wilderness Coalition has urged the inclusion of specific Forest rivers in the Wild and Scenic River System.

Members of the timber industry, such as Northwest Timber Association, have a stated issue position about how much timber will be available for harvest after meeting visual quality objectives.

- Level of ski area development.

Available studies suggest that skiing terrain within existing ski areas will be developed beyond the capacity of the area to accommodate the activity. An issue is that the Northwest Ski Association, especially Mt. Hood Meadows ski resort, is "extremely concerned" about restrictions that may apply to lands adjacent to permit boundaries.

Another issue with the Sierra Club, the Oregon Environmental Council, and the Friends of the Earth is that ski area developments will cause urbanization of the Mt. Hood Area.

The Oregon Nordic Club, and other cross country skiing enthusiasts, are actively seeking the Forest's aid in developing expansion of cross country ski opportunities, including winter trails and maintained winter parking, in order to disperse skiers and avoid congestion.

Other groups, such as the Crag Rats have made issue about the impacts from ski area development on unique sites such as Timberline Lodge and Cloud Cap Inn.

- Allocation of remaining roadless areas.

The roadless issue with the Mt. Hood Forest Study Group is that they feel that maintenance of the present roadless areas in a natural state is essential to the continuation of diverse recreation opportunities.

- Community stability and livability.

The close proximity of the Mt. Hood National Forest to the Portland metropolitan area has created a strong demand for outdoor recreation from individuals and organized groups. They have repeatedly voiced the issue that the Forest plays an important role in the leisure activities of Portland residents and has given them a special sense of ownership.

- Maintenance of anadromous and resident fish habitat.

The Northwest River Defense League and the Sierra Club have stated they would like the Clackamas, Salmon, and White Rivers designated under the Wild and Scenic Rivers Act. The Association of American Steelheaders and the East Multnomah County Soil & Water Conservation District have recommended the Forest Service consider recommending the Salmon River under the Wild and Scenic Rivers Act to protect its water quality and fish habitat.

2. Indicators of Responsiveness

The following *indicators of responsiveness* to Public Issue Group 4, dealing with the Forest's recreation resources, will be evaluated in each alternative:

- a. Number of naturally appearing viewsheds that, of the Forest's 48 most sensitive viewsheds, will be naturally appearing after 50 years?
- b. Number of naturally appearing viewsheds that, of the Forest's 48 most sensitive viewsheds, will be appearing slightly altered after 50 years?
- c. Supply of Dispersed Semi-Primitive Recreation Visitor Days/year.
- d. Motorized RVDs/year and Nonmotorized RVDs/year.

Explanation of Indicators

Visual quality objectives are measurable standards used in management of the visual resource. Each objective describes a different degree of alteration of the landscape. Viewsheds are those areas seen from a designated travel route or use area. The degree of alteration within a viewshed is a result of the management emphasis for the area and associated activities. The number of these viewsheds that remain natural appearing is a measure of how well an alternative responds to the visual concerns of forest visitors.

The amount of land managed to provide a semi-primitive recreation experience for visitors to the Forest is an indication of how well the Forest is meeting the demand for this type of experience and of the quality of the experience that can be provided. It can be measured by how many semi-primitive visitor days the areas can provide, which in turn is a reflection of the carrying capacity of the areas.

Public Issue Group 5:

Disposition of the Remaining Unroaded Areas

1. Issue Statements

This Public Issue group includes the following issue statements:

- Level of Timber Supply on the Mt. Hood National Forest.
- Location, Density, Design, and Standards of Forest Roads.
- 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.
- Allocation of the Remaining Roadless Areas.
- Maintenance of Anadromous and Resident Fish Habitat.

The Oregon Wilderness Act of 1984 left the Forest with approximately 130 thousand unroaded acres in 10 different areas. The Act released these areas to be managed for uses other than Wilderness. Congress intended to settle the Wilderness issue with the release language in the Act. However, the issue raised is a reaction to the Act. It became an issue of whether or not all of these remaining acres should be kept unroaded. Members of the Sierra Club have indicated their issue is keeping the unroaded areas in a natural state. Timber industry representatives, however, feel that the Wilderness Act released these lands for timber production and every opportunity to increase harvest levels by roading and harvesting in these remaining unroaded areas should be explored.

The Northwest Office of the Sierra Club, the Federation of Western Outdoor Clubs, and the Mt. Hood Forest Study Group have urged that the amenity benefits from retaining the areas in an unroaded condition be recognized and that the areas be maintained. They believe retention of these areas in a natural state is essential to maintaining diversity of the Forest's ecosystems, enhancing habitat of sensitive plant and animal species, preservation of water quality, continuation of diverse recreation opportunities, and perpetuation of wildlife populations. They have also stated they believe that the tree improvement program would be strengthened by the preservation of natural gene pools within Wilderness.

Earth First! has stated that they are opposed to any development, road building, or timber harvest in the existing roadless areas. They believe the California RARE II lawsuit applies to the entire National Forest System and maintain that development activities in RARE II areas are illegal until adequate site-specific EISs are done.

The issue of the Northwest Timber Association is about the amount of Forest land remaining available for timber harvest. Timber industry feels that areas not already designated as Wilderness should be developed as soon as possible for timber production. They feel the issue of timber harvesting on remaining roadless areas was resolved by the Wilderness Act, and the Forest should consider the roadless lands for multiple uses other than Wilderness or unroaded amenity benefits.

The State of Oregon has made an issue of the reduction of the timber land base and harvest level. The State is concerned about economic livelihood. The State is also concerned about preserving its environmental and scenic heritage.

2. Indicators of Responsiveness

The following *indicators of responsiveness* to Public Issue Group 5, dealing with unroaded areas, will be evaluated for each of the alternatives:

- a. The number of areas unroaded and unharvested after 15 years.
- b. The number of unroaded areas unroaded and unharvested after 50 years.

Explanation of Indicators

The number of areas remaining unroaded after the first decade of management under each Alternative is a measure of how that alternative responded to the concern about what will happen to the remaining unroaded areas identified in the RARE II process and left after the 1984 Oregon Wilderness Act. If an entire roadless area was protected by land allocations in a given alternative, its acreage was counted toward an area protected. If most of an area was designated for activities that allowed roads or timber harvest, the roadless resource was assumed to be lost.

Public Issue Group 6:

Community Dependence on Forest Resources

1. Issue Statements

This Public Issue group includes the following issue statements:

- Level of timber supply on the Mt. Hood National Forest.
- Economics of the timber sale program.

The Associated Oregon Loggers have taken the stand that the goal of the Mt. Hood National Forest's timber harvest schedule should be to contribute to the economic well-being of communities dependent on the timber production.

The Northwest Timber Association has repeatedly emphasized the importance of timber production in relation to community stability.

Timber supply to meet the local demand and needs of local industry that purchases timber from the Mt. Hood National Forest is an issue with the Industrial Forestry Association.



Timber from the Forest generates employment and income.

- Level of ski area development.

Forest users have reached or exceeded the capacity of existing public highways in or near the Mt. Hood National Forest during heavy use periods.

- Location, design, and standards of Forest roads.

The Hoodland and Hood River Chambers of Commerce have raised the issue that ski area development is vital to their communities' stability.

Local and Federal government agencies, such as the Parkdale Fire Department, the Oregon Department of Fish and Wildlife, and the Department of Interior have raised the issue that the demands on water supplies and sewage treatment needs resulting from the development of more ski area facilities within the Forest will place demands on them that they cannot meet.

Ski area developers of Mirror Mountain and Timberline, and land owners along the Highway 26 corridor have expressed the issue that timber harvesting will damage their recreation-oriented businesses as well as the property and scenic values of the area. Local residents have raised the issue that as the Highway 26 corridor population and ski area development increases, the conflicts associated with the interactions between public and private land ownership may be expected to continue. They are concerned that timber management will have adverse effects on local communities that depend on recreating Forest visitors for livelihood.

- Community stability and livability.

A major issue and concern of communities is that one of the most important economic factors of Forest Service management, the payments to counties in lieu of taxes and the payments from commodity receipts, continue at current or higher levels.

The Hoodland Chamber of Commerce has raised the issue that the economic lifeblood of their communities are dependent on the public that comes to the Forest to recreate and enjoy the scenery. The issue is that proper Forest management of recreation must be forthcoming to deal with future traffic and parking problems that will result from recreation use.

- Diminishing supply, or availability, of resources traditionally used in Indian religious and cultural life.

Native Americans on the Warm Springs Reservation have voiced an issue over the possible decrease in the availability of forest products they use in religious and cultural ceremonies. The Native Americans rely on the Forest for fish, wildlife and plants required for the sustenance of their craft activities, as well as their traditional practices.

2. Indicators of Responsiveness

The following indicators of responsiveness to Public Issue Group 6, dealing with community stability, will be evaluated for each of the alternatives:

a. Average Annual Payments to Counties within Influence Area. First decade Average Annual amounts paid by U.S. Treasury to counties in Influence Area from Forest commodity sales receipts.

b. Change in Jobs (Employment Index). Changes in relation to current levels as a result of changes in Forest contributions to Influence Area employment sources.

Explanation of Indicators

The amounts of the direct payments to counties from receipts of commodity sales of National Forest products and services is an indicator of how the management of the Forest under a given alternative contributes to the stability of local communities, when these funds constitute a significant portion of the county budgets.

Employment in local communities that result from production of goods and services from the Forest is also an indicator of the stability of local communities. This factor can be measured by the use of employment indexes derived from modeling processes that simulate the employment changes in the four county influence area that result from changes in Forest outputs by alternative

Interrelationships of Public Issue Groups

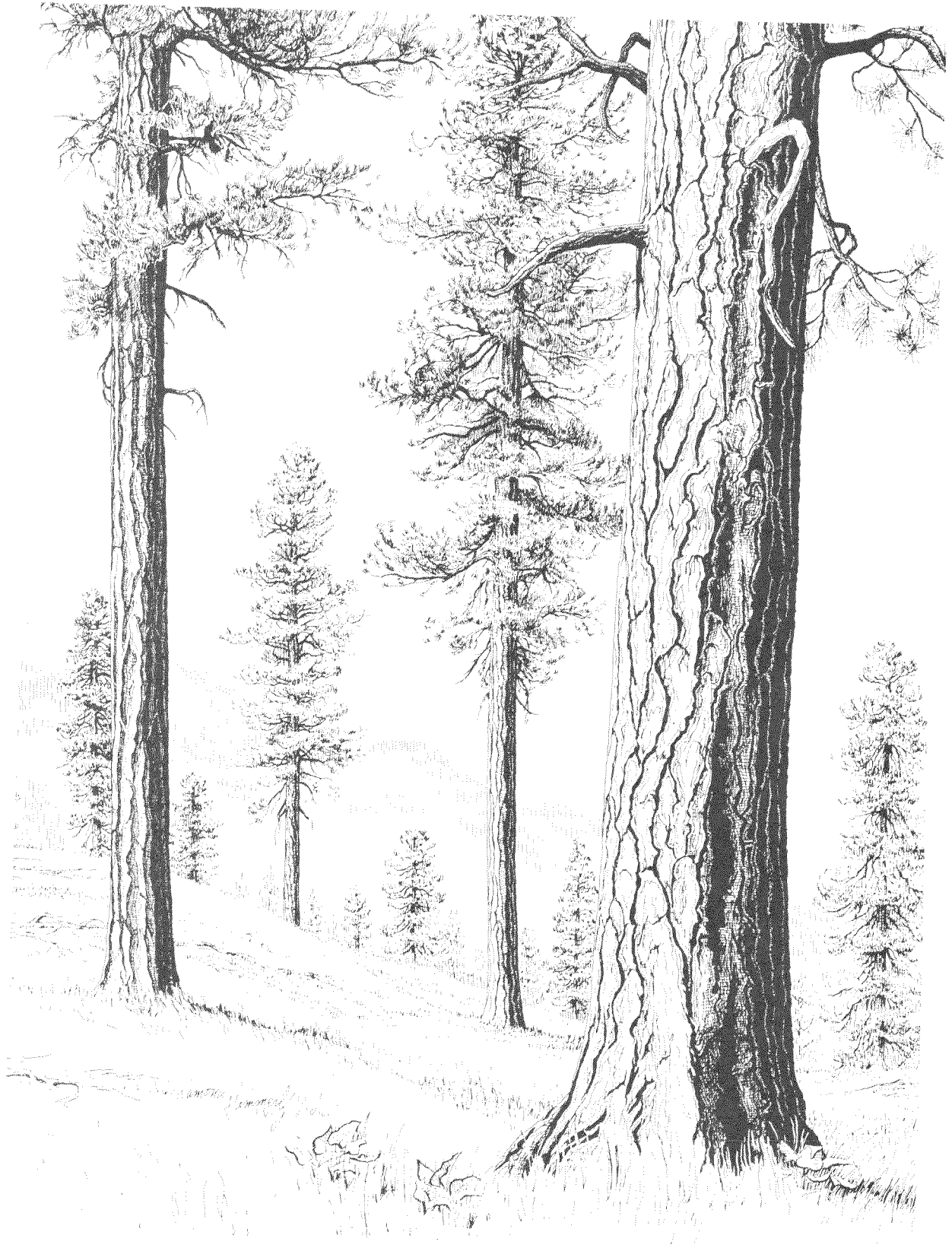
The following chart indicates the makeup of the Public Issues Groups in terms of the specific issue statements.

Table I-2

Public Issue Interrelationships

	Issue and Concern Groups					
	1	2	3	4	5	6
PUBLIC ISSUES						
Chemicals	not included in groups					
Timber Supply	X				X	
Timber Economics	X					X
Rd. Density	X	X	X	X	X	X
Hwy. capacity	not included in groups					
Old Growth	X	X		X		
Rec. conflicts				X		
Scenic Quality				X		
Ski Area Dev.	not included in groups					
Unroaded Areas				X		
Com. Stability	X					X
Fish Habitat		X	X			
MANAGEMENT CONCERNS						
Timber Target	X					
Firewood	X					
Cultural Res.						
T&E Species		X	X			
Key Habitats		X	X			
Noxious Weeds						
Domestic						
Water supply		X				X
Hydrologic Bal.		X				X
Soil Prod.						
Wilderness				X		
Dev. Recreation				X		
Fuel Mgmt/Air						
Quality	X					
Rock Supply	X				X	
Earthflows	X					
Non-Forest						
Land Uses						
Minerals & Energy						X
Hydroelectric						
Development						
Utility Corridors						
Native Americans						X

CHAPTER 2



Chapter II - Alternatives, Including the Proposed Action

A. Introduction

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

The chapter has been organized into three main parts:

Section B presents the formulation of alternatives. It addresses the process used to develop the ten alternatives considered in detail in this document.

Section C describes the alternatives. The ten alternatives considered in detail are presented, as well as alternatives evaluated and eliminated from detailed study. Since four of the ten alternatives considered in detail have timber sale schedules that are departures from non-declining flow, the term "departure" is defined and discussed.

Section D presents the more significant outputs, effects, economics, and tradeoffs of each of the ten alternatives considered in detail. Each alternative produces different combinations of resource outputs. This results in different effects on the Forest and the neighboring area. These effects or impacts are measured relative to various costs, benefits, and tradeoffs.

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

- Chapter I describes the Public Issues which guided the formulation of alternatives.
- Chapter III describes the environment affected by the proposed alternative ways of managing the Forest.
- Chapter IV addresses the environmental consequences of the ten alternatives developed in this chapter.
- Appendices to this DEIS describe various procedures and findings in greater detail.
- The Draft Forest Plan is a companion document to this DEIS and details the particular standards and activity schedules which are the operational part of the preferred alternative.

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

B. The Formulation Of Alternatives

1. Introduction

The process for formulating alternatives can be broken into five steps:

- Identifying legal requirements, resource capabilities, resource use and development opportunities, management concerns, and public issues.
- Collecting data and identifying analysis areas.
- Identifying management areas and developing management standards and corresponding integrated resource management prescriptions.
- Determining the decision space (potential range of resource outputs). Estimating how Present Net Value (PNV) and the resolution of public issues are affected by applying resource management prescriptions to selected places on the Forest.
- Developing a range of alternative goals and objectives which are feasible (fit within the decision space) and provide a range of responses to the public issues.

As a result of this process, ten alternative sets of goals were developed and considered in detail. Subject to meeting its set of objectives, each alternative maximizes its PNV. Each alternative is currently considered implementable on the ground, but this can only be proven during the plan implementation period. Except for Alternative NC (No Change) which does not incorporate minimum management requirements (MMR's), all alternatives meet or exceed minimum legal requirements.

Specifics regarding each of the five steps are as follows.

2. Identifying Legal Requirements, Resource Capabilities, Resource Use and Development Opportunities, Management Concerns, and Public Issues

a. Legal Requirements

The Forest Service implemented requirements of the National Forest Management Act of 1976 by publishing 36 CFR 219. These regulations required the Forest's Interdisciplinary Team (ID Team) to formulate a broad range of feasible alternatives for the future management of the Forest. In particular, 36 CFR 219.12(f) required the ID Team to "provide an adequate basis for identifying the alternatives that come nearest to maximizing net public benefits and are consistent with legal requirements while responding effectively to the Public Issues". Net public benefits are the overall long-term value to the nation of all outputs and positive effects (benefits) less all associated inputs and negative effects (costs) whether they can be quantitatively valued or not.

Net public benefits include both priced and nonpriced benefits. Priced benefits are those which are sold or could be sold in a marketplace. These include outputs such as timber, forage, and recreation opportunities. Nonpriced benefits are those for which there is no reasonable market evidence for estimating a dollar value. These include outputs such as threatened and endangered species.

Priced benefits are further divided into market and non-market outputs. Market outputs are routinely traded in an established market or return dollars to the United States Treasury (Treasury for short). These outputs include timber, livestock grazing, commercial harvest of anadromous fish, and developed recreation opportunities.

Nonmarket outputs are largely not sold in an established market and do not return dollars to the Treasury. However, these outputs could be sold in a market, and can be assigned a dollar value representing what a user would be willing to pay. These outputs include hunting, fishing, and other dispersed recreation opportunities.

A major component of net public benefits is Present Net Value (PNV): the difference between the discounted value (benefits) of all outputs to which monetary values or established market prices are assigned and the total discounted costs associated with an alternative.

The planning regulations [36 CFR 219.12(e) and (f)] and other direction set the framework for formulation of alternatives. Key points identified and followed by the ID Team include:

- Develop a broad range of alternatives that spans

maximum and minimum resource potentials (this defines the "decision space") to reflect the full range of major commodity and resource uses and values that could be produced from the Forest.

- Develop ways to respond to Public Issues, management concerns, and RPA targets; and demonstrate the future of current management direction.
- Follow criteria for displaying alternatives, including the purposes of proposed management direction, resultant conditions and uses, resultant goods and services, their timing and flows, costs and benefits, and management standards and guidelines.
- Analyze and evaluate resource outputs and effects, net benefits, responses to Public Issues, management concerns, resource use and development opportunities and tradeoffs.

b. Resource Capabilities

A basic step in developing the Forest Plan is to formulate alternative ways to respond to the Public Issues. The different alternatives must take into account the different emphases placed on products such as timber, water, fish, services such as recreation and sightseeing, and environmental conditions people either want or do not want. Because one of the ways to look at the Forest is to see a complex ecological environment, all of its resources - the land, the water, the wildlife, the plant life, and the scenery - are interconnected. If special emphasis is placed on one resource, that emphasis affects other resources. Sometimes the interacting effects are negative. Other interactions may be complementary so that a program that emphasizes one particular resource can also enhance another.

Therefore, managers must consider the the following major planning components in addition to the Public Issues identified and discussed in Chapter I as they prepare to respond to the Public Issues by defining a suitable range of alternatives that meet or exceed environmental quality standards:

- The physical limitations of the Forest
- The biological capabilities of the Forest's resources
- The legal constraints placed on Forest management

Experience shows that these planning components can be expressed in terms of resource use and development opportunities and management concerns.

These components are discussed on the following pages.

c. Resource Use and Development Opportunities

These are opportunities to develop and use biological and physical resources of the Forest. These opportunities are reflected in this chapter in terms of benchmarks and decision space. The full spectrum of opportunities is presented in Appendix A. The following table cross references these opportunities to the Public Issues and the numbers used to denote the opportunities in Appendix A.

d. Management Concerns

In responding to the Public Issues that emerged, the Forest Management Team (FMT) developed a list of management concerns as per planning regulations (219.12b). These are problems or conditions identified by the FMT which affect the range of management practices. These are also the legal and regulatory requirements that set boundaries for the formulation of alternatives. The full rationale for each of these management concerns is presented in Appendix A of this DEIS along

Table II-1

Resource Use And Development Opportunities And Public Issues

RESOURCE OPPORTUNITIES		PUBLIC ISSUES					
Number ^{1/}	Name	Timber	Fish & Water	Wildlife	Recreation	Unroaded Areas	Communities
1.	Timber Harvest	X	X	X	X	X	X
2.	Timber Supply	X					
3.	Roads	X	X	X	X	X	X
4.	Trail System	X			X	X	
5.	Trails	X			X	X	
6.	Barlow Road	X			X		X
7.	Fish Projects	X	X		X		X
8.	Vegetative Mgmt.	X	X	X	X		
9.	Recreation	X			X		X
10.	Winter Recreation	X			X	X	X
11.	Recreation Invest	X	X		X	X	X
12.	Interpretation				X		X
13.	Prescribed Fire	X		X			
14.	Underburning	X		X			
15.	Soil rehab.	X	X	X			X
16.	Urban Outreach				X		X
17.	Anadromous Fish Enhancement	X	X		X		X

Table II-2

Management Concerns And Public Issues

MANAGEMENT CONCERNS		PUBLIC ISSUES					
Number in Appendix A	Name	Timber	Fish & Water	Wildlife	Recreation	Unroaded Areas	Communities
1.	Timber Program	X		X	X	X	X
2.	Firewood	X		X	X		X
3.	Cultural Resource	X			X	X	X
4.	T&E Species	X	X	X	X	X	X
5.	Key Habitats	X	X	X	X	X	X
6.	Noxious Weeds	X		X			X
7.	Domestic Water Supply	X	X				X
8.	Hydrologic Balance	X	X	X			X
9.	Soil Productivity	X					X
10.	Wilderness				X	X	X
11.	Developed Recreation		X	X	X		X
12.	Fuel Mgmt/Air Quality	X			X		X
13.	Rock Supply	X					X
14.	Earthflows	X	X				
15.	Non Forest Land Uses				X		X
16.	Minerals & Energy					X	X
17.	Hydroelectric Devel.		X			X	X
18.	Utility Corridors	X	X	X	X	X	X

with the process for development of the Public Issues. The physical, biological, and legal implications of these planning components are discussed in terms of the responses to the Public Issues in this chapter and in Chapter Three of the "Proposed Forest Land and Resource Management Plan" (Forest Plan). Table II-2 cross references the management concerns to the Public Issues. Since the management concerns are numbered in Appendix A, the applicable number is also referenced in this table.

e. Public Issues

Public issues and decision space analysis provided the foundation for developing the alternatives. Public issues are the basis for comparing the efficiency and effectiveness of the alternatives. These public issues are presented in Chapter I of this document. The development of public issues and the relationship of the management concerns to the issues is described in Appendix A, DEIS.

3. Collecting Data and Identifying Analysis Areas

a. Data Collection

The types and accuracy of the data collected are addressed in Appendix B, DEIS. Some of the data are presented in the March 1985 document "Analysis of the Management Situation." Data collected since that time are included in applicable process papers, which are part of the Forest's planning records.

The basic data regarding the size, growth, and yield of commercial timber species were gathered during an inventory which was completed in 1972. Management activities since that time have been tracked in the Forest's Total Resource Inventory (TRI) data base. TRI was used to update the inventory as of 1983, when it began to be used as part of the planning process described in this document. A new inventory is currently being prepared, the results of which will probably not be available until mid-1988. The new data will be used to determine whether changes are sufficiently significant to require amendment of the draft or final plans.

b. Analysis Areas

As part of the data collection process, an inventory of the entire Forest was completed using a computerized grid mapping system (GMS) built out of 21.3-acre cells. Each of the Forest's 51,604 cells was analyzed with respect to the following parameters and assigned to one of 365 combinations thereof: drainage (15 of which comprise the Forest), presence/absence of a transportation system, steepness of slope, timber species, site productivity, existing size and age of timber, and suitability for

timber harvesting. The 365 different combinations of these factors are called analysis areas. They are aggregations of areas which are expected to respond similarly to a specific type of vegetative management. The cells comprising an analysis area are scattered throughout the Forest. They are not contiguous. These 365 analysis areas were analyzed in a linear programming model called FORPLAN (Forest Planning Model). The analysis areas and the FORPLAN model were used to derive optimum timber management activities.

Many other attributes of the GMS inventory were used in the alternative formulation process. Among these attributes were visual quality, unroaded management opportunities, fish habitat and water quality, wildlife habitat relationships, and opportunities to provide for research or other special needs. These attribute combinations were assessed by the ID Team outside the FORPLAN model and used in defining the 22 management areas that were needed to provide a range of responses to the Public Issues. ID Team members used GMS to derive and analyze nontimber effects.

4. Identifying Management Areas and Developing Management Standards and Resource Management Prescriptions

a. Management Areas

A management area is comprised of portions of the Forest managed in accordance with objectives and standards which will respond to the Public Issues in one of 22 ways. The 22 sets of management objectives are summarized in Section C of this Chapter. Management areas differ from analysis areas by addressing all types of management, not just those associated with vegetation.

Before alternatives were fully designed, the potential management areas overlapped because a given acre could be suitable for responding to more than one set of resource objectives. However, part of the development of a specific alternative entailed designating management areas to respond the Public Issues in a way which met the goals of the alternative. So, alternative development results in each acre of the Forest being assigned to only one of the 22 possible management areas. Alternatives often differ as to what management area is assigned to a specific acre.

Direction, including some components of prescriptions, is written for each management area to achieve the objectives associated with the area. This direction addresses the avoidance or mitigation of potentially adverse environmental conditions resulting from management activities within the area.

Brief descriptions of each management area as designated in the various alternatives are on the management area maps that accompany this document. Details of the management practices applicable to the Forest's Preferred Alternative and the standards for achieving management area goals are presented in Chapter IV of the accompanying document, "Proposed Land and Resource Management Plan" (Forest Plan). Many of these management areas pertain to all alternatives. Acres and locations may vary by alternative, but the standards for a particular management area do not. There are a few management areas which do not pertain to the preferred alternative. See Appendix D for the standards regarding these other management areas.

To summarize, management areas normally include parts of many analysis areas. They form the basis for implementing and monitoring the Forest Plan. The number of acres designated to and/or location of specific management areas varies among the alternatives. The alternative maps accompanying this DEIS depict the location of the management areas.

b. Management Direction and Prescriptions

Management Direction and management prescriptions are defined in 36 CFR 219.3.

Management Direction: A statement of multiple-use and other goals and objectives, the associated management prescriptions and standards for attaining them.

Management Prescription: Management practices and intensity selected and scheduled for application on a specific area to attain multiple-use and other goals and objectives.

Chapter IV of the Proposed Forest Plan lists direction which pertains to all management area. This is referred to as "Forest-wide direction." When direction specific to an individual management area is more restrictive, i.e. results in fewer changes in the environment than Forest-wide direction, the specific direction in the standards for a particular management area takes precedence.

Although the direction pertaining to management areas often addresses more than one Public Issue, areas are differentiated from one another by the relative emphasis their specific direction places on resolving particular Public Issues. Management area prescriptions are quite detailed. This is because the management practices and intensities are imbedded in the management direction.

When the 22 management areas are discussed in detail in Section C of this chapter, it will be noted that they fall into one of three categories: Category A, B, or C. The following is a summary of the relationship of the prescriptions for management area categories to the harvest yields modeled in FORPLAN, the linear programming model used.

Chargeable harvesting of green timber is not allowed in Category A Management Areas (Wilderness, Northern Spotted Owl Habitat, etc.). Chargeable harvesting at reduced rates is scheduled in the aggregation of Category B Management Areas (Scenic Viewsheds, General Riparian Areas, etc.). The Category C Management Area is managed intensively for timber, subject to the dispersion minimum management requirement (MMR) regarding the size and distance apart of created openings. MMR's are discussed in more detail in the following pages. This dispersion MMR has the effect of limiting harvests to not more than about a third of the suitable and merchantable timber in a drainage per decade. Although the dispersion MMR helps respond to Public Issues regarding wildlife, fish habitat and water quality needs, and plant and animal diversity, dispersion relates directly to 36 CFR 219.27(d) regarding forest openings as they affect the productivity of the timber resource.

5. Determining the Decision Space and Analyzing Relationships

a. Benchmarks

Benchmark analysis, a part of the Analysis of the Management Situation [36 CFR 219-12(e)], was performed to establish the extent that the resources of the Forest could respond to the Public Issues. The understanding of tradeoffs gained through this analysis was fundamental to the formulation of alternatives because it provided a predictive capability regarding allocation of acres to achieve resource objectives.

Benchmark analysis established the extent to which alternatives could be designed to respond to the Public Issues. The analysis was performed by beginning with minimum management requirements (MMR's), assigning maximum resources (acres, dollars, management emphasis, etc.) in response to particular Public Issues, and then determining how well all of the Public Issues were satisfied. The MMR's are defined and tradeoffs identified with respect to the benchmark which maximizes PNV. Seven of the benchmarks incorporated the MMR's and became some of the "alternatives evaluated and eliminated from detailed study". They are described in Section C of this chapter.

b. Decision Space

Indicators of responsiveness to the Public Issues were defined in Chapter I, DEIS. The responsiveness of eight benchmark formulations containing MMR's, plus the "Maximize PNV, without MMR's" benchmark are quantified in Table II-3 on the following page with respect to these indicators. It should be noted that the ID Team also evaluated many other outputs and effects. For ex-

Table II-3

Summary Of Benchmark Decision Space

PUBLIC ISSUE GROUP 1/ Indicators of Responsiveness	Minimum Level	B E N C H M A R K					T H E M E S			
		Max PNV (Market Values) -No MMRs- 2/	Max PNV (Market Values) -MMRs-	Max PNV (Assigned Values) -MMRs-	Max Timber (Even Flow) -MMRs-	Max Timber (Departure) -MMRs- 3/	Max Wildlife -MMRs-	Max Visual Quality -MMRs-	Max Fish & Water -MMRs-	Max Unroaded Areas -MMRs-
ISSUE 1: TIMBER Average Annual MMBF, First Decade Allowable Sale Quantity, Green (ASQ)	0	3360	2870	2870	3040	4270	1140	2070	1300	2460
	100	4360	3630	3630	3830	5310	1470	2650	2030	3110
	0	662	565	565	599	565	288	437	281	485
	0	662	565	565	599	565	288	437	281	485
ISSUE 2: FISH HABITAT AND WATER QUALITY Aquatic Habitat Stability Index . Acres Explicitly Managed to Meet Riparian Objectives. .	N.E.	0.0	2.7	2.7	2.7	0.9	N.E.	N.E.	N.E.	N.E.
	166,300	0	82,800	82,800	166,300	166,300	166,300	166,300	284,800	166,300
ISSUE 3: WILDLIFE Acres of Old Growth after 50 Yrs. Acres of Young Growth after 50 Yrs.	448,000	134,400	225,300	225,300	180,000	170,000	404,000	288,000	346,000	261,000
	N.E.	117,400	112,300	112,300	87,600	125,000	86,100	69,500	43,200	76,400
ISSUE 4: RECREATION Naturally Appearing Viewsheds after 50 Years	48	0	5	5	5	5	N.E.	22	N.E.	10
	48	0	0	0	0	0	N.E.	24	N.E.	0
	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.
	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.
ISSUE 5: UNROADED AREAS Areas Unroaded after 15 Years. . Areas Unroaded after 50 Years. .	10	0	0	0	0	0	10	.5	10	10
	10	0	0	0	0	0	0	3.5	0	10
ISSUE 6: COMMUNITIES \$MM Average Annual Payments to Counties	N.E.	11	9	9	10	14	4	7	5	8
	N.E.	+1,700	+ 700	+ 700	+ 900	+ 3,500	- 3,300	- 1,200	- 2,300	- 400

1/ See Chapter I for details regarding the indicators mentioned above. Appendix B, DEIS provides additional information regarding the benchmarks and minimum level.

2/ All of the benchmarks shown in this table, except for the "Max PNV without MMR's" Benchmark, have MMR's.

3/ All of the benchmarks shown in this table, except for the "Max Timber (Departure)" Benchmark, are constrained by the nondeclining flow harvest policy.

ample, in addition to viewshed appearance and semi-primitive motorized and nonmotorized RVD's, the Recreation Public Issue also relates to the quality and quantity of recreation in developed settings. The maximum and minimum values shown in this table established the range of outputs that could conceivably be produced in response to the Public Issues. It also shows tradeoffs: producing the maximum relative to one Public Issue can result in producing very little relative to some other Public Issue.

c. Minimum Management Requirements

36 CFR 219.27 sets forth the "minimum specific management requirements to be met in accomplishing goals and objectives for the National Forest System. These requirements guide the development, analysis, approval, implementation, monitoring and evaluation of forest plans." The complete list of minimum management requirements (MMR's) is listed on the following page. The method of incorporating each MMR in the formulation of alternatives is indicated.

The MMR's explicitly modeled on the Mt. Hood National Forest are as follows (acreages cited include lands which are both suitable and unsuitable for timber production).

Dispersion

Limitations regarding the size and spacing of openings created in vegetation over time. This resulted in a constraint being placed on the FORPLAN model precluding the harvesting of more than a third of an analysis area per decade.

Spotted Owl

Dedication of habitat for old growth dependent species. The current interpretation of this constraint is that 51 Spotted Owl Habitat Areas (SOHAs), each comprised of 1,000 acres of suitable habitat, are to be maintained through the 50-year planning horizon. About 14,000 of the 51,000 acres necessary to meet this requirement occur in either the Bull Run Watershed or in existing Wilderness areas. Chargeable timber harvesting is not permitted in SOHAs.

Key Site Riparian and Water Quality

Allocation of selected fish habitat and water quality areas having unique characteristics or benefits. Maximum management emphasis is assigned to riparian dependent resources (fish, water, etc.). Geographic distribution and representation of all fish habitat and water quality types were major considerations of the MMR level. About 9,000 acres are involved. Chargeable timber harvesting is not permitted.

Pileated Woodpecker and Pine Marten

Limitation on the amount of timber harvesting in areas of 600 acres and 300 acres, respectively, managed to meet the requirements of these indicator species. About 61,000 acres are needed to meet these needs at the MMR level. Chargeable timber harvesting is permitted under conditions which meet these indicator species' minimum habitat needs.

General Riparian and Water Quality

Limitation on timber harvesting along streams to meet riparian related management objectives. Relatively high levels of other multiple use management activities are allowed. Extended rotation timber management is to occur along perennial and fish bearing streams, wetlands, lakes, and reservoirs. Normal rotation timber management is allowed in seeps, springs, and intermittent stream fish habitat and water quality areas. At the MMR level, about 66,000 acres are needed. Chargeable timber harvesting is permitted under conditions which meet the fish habitat and water quality objectives.

The following direction requires all alternatives to comply with minimum management requirements (MMR's):^{1/}

- Regulations pursuant to NFMA : 36 CFR 219.27
- USDA, Forest Service, Direction : February 26, 1982 letter (1920, Cargill)

See Appendix G, DEIS, for a detailed discussion of the MMR's and the analysis of the sensitivity of timber harvesting under various alternatives to changes in the assumed level of MMR's. Appendix F describes the potential impact of the Draft Supplement to the Pacific Northwest Regional Guide (which provides guidelines for spotted owl management) on the Draft Forest Land and Resource Management Plan.

Table II-4 lists economic and harvest tradeoffs associated with the individual and collective MMR's. All scenarios referenced in this table were the result of FORPLAN runs which had Maximum PNV objectives and were constrained by nondeclining flow of timber. Changes indicate how the Max PNV Benchmark varied as the MMR's were individually added.

6. Developing a Range of Alternative Goals and Objectives which are Feasible and Responsive to Public Issues

Section C of this chapter describes the public response

^{1/}Alternative NC does not comply with MMR's, as it is a reflection of current management under the ten year old Timber Management Plan/

List of MMRs

Minimum Management Requirements

Method of Incorporation (See Key)

219.27(a) Resource protection

(1) Conserve soil and water resources.	2
(2) Minimize effects of natural hazards.	2
(3) Reduce pest hazards.	1
(4) Protect fish habitat and water quality areas and aquatic resources.	3
(5) Provide plant/animal community diversity.	3
(6) Maintain viable wildlife populations.	3
(7) Conduct project environmental assessment.	1
(8) Protect habitat for threatened/endangered species.	1,3
(9) Designate right-of-way corridors.	1
(10) Construct roads appropriate for use.	1
(11) Rehabilitate temporary roads within ten years.	1
(12) Maintain air quality.	1

219.27(b) Vegetative manipulation

(1) Prescriptions are to meet management area objectives.	1
(2) Ensure adequate restocking of timber management areas.	1
(3) Producing greatest volume or revenue is not necessary.	1
(4) Consider residual trees and adjacent stands.	1
(5) Maintain site productivity.	1
(6) Provide desired results.	1
(7) Be practical in terms of costs.	1

219.27(c) Silvicultural practices

(1) Regulated harvest on suitable acres only.	1
(2) Establish allowable sale quantity (ASQ) under nondecline.	1
(3) Restock within five years.	1
(4) Cultural treatments may be used to meet objectives.	1
(5) ASQ may be changed as management practices are monitored.	1
(6) Even-aged management should protect resources.	1
(7) Consider pest management.	1

219.27(d) Even-aged management

(1) Forest openings are defined by management objectives	2
(2) Harvest opening size limits	2

219.27(e) Special attention will be given to fish habitat and water quality areas. 2,3

219.27(f) Soil and water conservation will be guided by official technical handbooks. 1
2,3

Key:

1: Provided by management direction, but not explicitly modeled.

2: Modeled through harvest area scheduling constraints ("dispersion" MMR).

3: Modeled by special management prescriptions in selected management areas (Northern Spotted Owl Habitat, Key Site Riparian, Pileated Woodpecker and Pine Marten Habitat, and General Riparian MMR's).

Table II-4

MMR Effects On The Max Pnv Benchmark's Harvests And Economics

Changes are indicated within parentheses ()

MMR	HARVEST TRADEOFFS				ECONOMIC TRADEOFFS (Millions of Dollars)			Percent Change in PNV
	LTSYC		First Decade, Average Annual ASO (Green)		PNV	Benefits	Costs	
	MMCF	%	MMBF	%				
Reference Without MMRs	66.2	100	336	100	2784	3781	997	100
Harvest Dispersion	(-0.8)	(-1)	(- 4)	(-1)	(- 74)	(- 76)	(- 2)	(-3)
Spotted Owl	(-3.6)	(-5)	(-18)	(-5)	(- 94)	(-207)	(-113)	(-3)
Key Site Riparian	(-0.7)	(-1)	(- 4)	(-1)	(- 18)	(- 39)	(- 21)	(-1)
Woodpecker & Marten	(-2.4)	(-4)	(-12)	(-4)	(- 63)	(-138)	(- 75)	(-2)
General Riparian	(-1.8)	(-3)	(- 9)	(-3)	(- 45)	(-100)	(- 55)	(-2)
All MMRs	(-9.6)	(-14)	(-47)	(-14)	(-294)	(-560)	(-266)	(-11)

goals which form the basis for the alternatives. It was the ID Team's job to determine the allocations, standards, and schedules which would best meet these goals while maximizing PNV. The Team was mindful of the following considerations during this process: legal requirements, public issues, management concerns, resource capabilities, analysis areas, management direction, prescriptions, decision space, and MMR's.

The ID Team, not the FORPLAN model, integrated knowledge of the components listed above to make the tentative management area allocations. These management area allocations were varied considerably among alternatives in order to provide the basis for assessing opportunity costs and tradeoffs in the search for efficient ways of responding to the Public Issues.

The FORPLAN model was then used to determine an optimal harvest program that was compatible with the management of other resources.

Public Issues, management concerns, MMR's, legal requirements, resource capabilities, and environmental standards determined the data, objectives and constraints to be modeled in FORPLAN.

In using FORPLAN to determine harvest programs, the ID Team specified various sets of environmental or policy constraints. Such constraints were often designed to assure that legal requirements and specified environmental standards and objectives would be satisfied. Constraints applied in FORPLAN must be satisfied before any other objective can be met by the model.

As the preceding information suggests, the process of formulating a particular alternative included:

- Analysis prior to use of FORPLAN, such as

specifying MMR's and allocating land to address public issues.

- Using FORPLAN to determine vegetative management schedules, subject to meeting environmental or policy objectives, so as to maximize PNV.
- Analysis supplemental to FORPLAN, such as that pertaining to developed recreation.
- Evaluation and interpretation of the results of these analyses.

As a result of the analyses of tentative alternatives, management prescriptions for every acre of land on the Forest were identified. These prescriptions best meet the objectives of each particular alternative. FORPLAN provided schedules of timber harvests for each alternative, as well as reports of associated costs, benefits, outputs, and effects. After considering FORPLAN results and analyses done outside of FORPLAN, the ID Team reviewed each alternative to determine if:

1. It met the stated objectives of the alternative and addressed the selected issues and concerns.
2. It was significantly different from other ways of managing the Forest which had already been developed.
3. It would be implementable on the ground. This was done by considering factors which could not be analyzed in a quantitative manner in the model.

If one or more of these conditions was not met, the alternative was either revised (different prescriptions assigned, FORPLAN rerun, and responsiveness to Public Issues re-evaluated) or dropped from further consideration.

Those who would like to know more about the use of FORPLAN in analyzing alternatives may refer to Appendix B, DEIS, which contains a more thorough description of the technical aspects of the process.

C. Description Of Alternatives

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

1. Required Alternatives.

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

a. Current Direction (No Action).

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

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

b. No Change.

This alternative responds to the Regional direction to project the most likely condition of the Forest in the future if current management practices and policies are not changed, and analytical techniques and legal require-

ments remained as they were when the existing Timber Management Plan was adopted in 1977. As such, this alternative predates the National Forest Management Act regulations, 36 CFR Part 219, of 1979. It uses a commercial forest land base which is 106,000 acres larger than the other alternatives' tentatively suitable base.

This is the only alternative to use the earlier version of the tentatively suitable land base, and it is the only alternative not explicitly responding to MMRs. Timber harvest levels were determined using RAM, which was a linear programming model which predated and was superseded by FORPLAN. This alternative is identified as Alternative NC.

c. Emphasis on the RPA Program.

This alternative is in response to the 36 CFR 219.12(f)(6) requirement that at least one alternative be developed that responds to and incorporates the RPA Program targets and resource objectives. This is Alternative B.

d. Emphasis on market opportunities.

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

e. Emphasis on nonmarket opportunities.

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

f. Emphasis on nondevelopment and intensified management.

Alternative E is responsive to nondevelopment as well as intensive management opportunities. Under this alternative, four of the largest unroaded areas would remain unroaded. Commodity production would be emphasized on the remainder of the Forest.

This alternative incorporates the MMRs and uses the best available data regarding the suitability of land for harvesting timber, timber utilization standards, and analytical techniques. Timber harvest levels are determined using the FORPLAN model. This alternative assumes that the MMR's are incorporated into the current direction.

Additional alternatives were designed in compliance with 36 CFR 219.12(f)(1) which requires that they reflect

the maximum and minimum resource potentials in order to show the full ranges of Forest production capabilities. These additional alternatives are needed to provide a full range of responses to the Public Issues, management concerns, resource uses, and development opportunities. Alternatives D, F, and G respond to these objectives.

g. Preferred alternative

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

2. Alternatives Evaluated and Eliminated from Detailed Study.

a. Benchmarks.

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

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

Maximum Timber Benchmarks (even-flow and departure).

The differences between these benchmarks and the maximum PNV benchmark are the stated objective of maximum timber production and the prohibition of recreation in the Bull Run Watershed. In addition, the departure benchmark departs from nondeclining even flow of timber in maximizing total timber volume. The timber volume of Alternative C was developed from this benchmark by specifying a 30-year period for maximized timber volume. The objective of maximizing timber production has also been incorporated into three other alternatives. Alternatives B, D and E depart from non-

declining flow and include needs for resources other than timber beyond the minimum requirements.

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

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

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

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

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

b. Other Alternatives Evaluated and Eliminated.

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

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

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

First decade timber volume in this alternative would be 191 MMBF/year (37.8 MMCF/year) which is 25 MMBF/year more than the volume of Alternative F. However, this volume is far less than the 287 MMBF/year (56.6 MMCF/year) which would result from the Maximum Economic Efficiency Benchmark. Alternative F-departure has been dropped from further consideration for two reasons. First, the timber objective cannot be attained while meeting the objective of a high level of nonmarket outputs. Second, Alternative E also meets most of the objectives of this alternative while coming closer to producing the desired timber volume.

Alternative J. The objectives of this alternative are to maximize nonmarket values. It is similar to Alternative I, but precludes timber harvest in selected viewsheds, watersheds, and all old growth timber. As a result, the impact on market values, as indicated by timber volume, is a first decade harvest of 8 MMBF/year (1.5 MMCF), and a long-term sustained yield capacity of 6.5 MMCF/year achieved in 140 years. Ninety thousand acres would be available for timber harvest, but managed at less than its productive potential.

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

Second, the social and economic impact of essentially eliminating the timber program on the Forest would be extreme. The four nearby counties would lose an estimated 9,000 jobs in the next decade, and many of those jobs are in small communities which depend on the forest products industry.

Alternative K. This alternative was designed to meet the timber volume objectives of the Forestry Program for Oregon defined by the Oregon State Department of Forestry as 111.3 MMCF/year (564 MMBF), first decade. It would make all suitable land available for unrestricted timber management and would depart from nondeclining flow. Its only significant constraint on timber production would be a limit of 25 percent to changes of harvest volumes between decades. This would provide some degree of predictability to timber-based economies. However, there would be no minimum volume required in any decade, and volume could be harvested in some decades at levels below the long term sustained yield capacity. The alternative fails to provide constraints to assure that minimum management requirements are met.

Volume produced in the first decade would be 151 MMCF/year (766 MMBF), ASQ, green, and this alternative indicated that the Forestry Program for Oregon targets could be achieved for 30 years. However, harvest levels would fall below long-term sustained yield capacity in the fifth through the twelfth decades and reach a minimum of 24.6 MMCF/year in the eighth decade. The ability to reach long-term sustained yield capacity in 150 years would not be adversely affected.

Further options from scheduling timber harvest were not pursued, and this alternative was dropped from additional analysis. Its failure to meet MMRs would render it impossible to implement under existing laws and regulations. The immediate social and economic effects on the local tourism industry would most likely be extremely negative, as would the social and economic effects of declining volume in later decades on communities which depend on timber. Rapid growth in the short run would strain community services. Finally, the Forestry Program for Oregon basic objectives are substantially satisfied by Alternative C, even though that alternative does not meet the timber volume requirements (see section D of Chapter II, Table II-16 and accompanying discussion).

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

- Bull Run Municipal Watershed
- Columbia Gorge and Timberline Lodge Viewsheds
- Areas susceptible to earth flows
- Several small special interest areas and research natural areas
- Clackamas and Salmon Rivers proposed for Wild and Scenic Rivers designation
- Pine/oak wildlife habitat
- Selected fish habitat and water quality areas
- Remaining portion of the Olallie Study Area.

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

Initial analysis of this alternative indicated that it could provide a first decade Allowable Sale Quantity (ASQ), green, of 308 MMBF/year (60.7 MMCF/year). The long-term sustained yield capacity would be 47.9 MMCF/year. This was compared to Alternative D which would yield 287 MMBF/year (56.6 MMCF/year) in the first decade and 45.6 MMCF/year long-term sustained yield capacity. All nonmarket objectives in L have been met in D.

The difference of about 7 percent in first decade timber volume between Alternative L and Alternative D was insufficient to justify development of both. Fully developing Alternative D led to a more even range of alternatives by more evenly splitting the difference between the first decade ASQ's of Alternatives E and B.

Alternative M. This alternative is based on the Maximum Wildlife and Maximum Fish and Water Benchmarks. It is designed to be fully responsive to the group of Public Issues related to wildlife and fish habitat and water quality resources. In addition, it would retain approximately 75 percent of the remaining nonwilderness/unroaded areas without roads and preserve the natural appearance of the most sensitive viewsheds.

This alternative would yield an ASQ, green, timber volume of 144 MMBF/year (28.5 MMCF/year) in the first decade, and 34.9 MMCF/year long-term sustained yield capacity. Harvests would be from 428,000 acres managed for timber. These results are very similar to those of Alternative I which differs in terms of long-term

sustained yield capacity from Alternative M by less than 3 percent. As Alternative I responds equally well to the wildlife habitat and fish habitat and water quality resource issues, Alternative M does not offer a significantly different proposal, and it has been eliminated from further consideration.

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

Of the 647,000 acre tentatively suitable timber base, the Forest does not have a backlog of remaining areas requiring reforestation. Therefore, the Forest has no areas where per acre value is based on the costs and benefits of managing a timber stand from the time it is restocked with trees, whether planted or allowed to regenerate naturally, through the final harvest. Present net values of all existing stands have been computed at the appropriate intermediate points of their life cycles, and include the value of standing timber.

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

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

Alternative O proposed further increases in the primitive and semi-primitive nonmotorized recreational opportunities by managing the Bull Run Municipal Watershed for recreational benefits as well as water quality. If the Bull Run Watershed were managed for recreation, 61,000 dispersed unroaded, 350,000 dispersed roaded, and 34,000 developed RVDs would be added per year for the first decade. (RVDs have been defined in the glossary.) Over the 150-year planning horizon, the present net value of these benefits would amount to

about \$8,000,000 after paying all costs of building and operating a water treatment plant to guarantee potable drinking water to Portland.

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

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

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

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

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

Among fully developed alternatives, Alternative H places the greatest emphasis on retaining unroaded resources and old growth. However, this alternative

would allow only about half as many acres in management similar to the commercial forest land category.

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

3. Use of Departures in Alternatives.

Existing management plans for national forests provide for nondeclining flow (NDF) of timber as common policy. The NDF policy schedules timber sales so that Allowable Sale Quantities (ASQs) in all future decades would be equal to or greater than those of the present level. NDF was the goal of timber planning in the Forest Service until the National Forest Management Act allowed managers additional flexibility.

A "departure" from NDF allows ASQ's in future decades to be less than that for a preceding decade. It would involve a temporary rise in timber harvest volume, followed by a planned reduction in volume in subsequent decades. Short-term increased harvest may meet local economic, social, or biological needs better than a non-declining flow policy.

NFMA planning regulations allow for the development of alternatives which depart from the nondeclining policy when conditions indicate that the departure may reasonably be expected to improve overall multiple-use management (36 CFR 219.16(a)(3)). Specific conditions on the Forest which may dictate the development of departure alternatives include:

- a. No base sale (nondeclining) schedule of timber harvest volume will achieve the assigned goals of the RPA program.
- b. Forest timber age-class distribution can be improved.
- c. All base timber sale schedules could cause substantial adverse economic impacts.

The base sale schedule developed for any alternative under consideration will be lower than recent harvest levels. This is largely because harvest levels under the existing timber management plan are based on a commercial forest land base of 753,000 acres that is 16 percent larger than the tentative suitable acre base of 647,000 acres resulting from the NFMA requirements and used for alternative development.

Table II-5
First Decade Departure Volumes

ALTERNATIVE LAND BASE	BASE SALE SCHEDULE	DEPARTURE	INCREASE OVER BASE
B C D E & G F	261 287 231 222 2/ 166 3/	335 1/ 393 1/ 287 1/ 255 2/ 191	28% 37% 24% 15% 15%

- 1/ The departure versions of Alternatives B, C, and D became the final version of fully developed alternatives.
- 2/ The version involving the base sale schedule became Alternative G. The departure version became Alternative E.
- 3/ The base sale schedule became part of a fully developed alternative.

In developing alternatives, departures were used as one means of addressing the timber supply and community stability issues. When the base sale schedule failed to adequately address these issues, the departure schedule was selected for the alternative. Consequently, four of the Forest's proposed alternatives incorporate departures, while the others provide nondeclining flow of timber.

Various methods may be used to develop departure schedules for alternatives, depending on the alternative's objectives and amounts of timber desired at different times. When a fully developed alternative employs a departure, the specific approach is explained in the description of that alternative.

Table II-5, First Decade Departure Volumes, presents information that compares departure and base sale schedules for the alternatives where this information is available. The base sale schedule and departure variations in timber harvest scheduling were not fully developed as separate alternatives, except for Alternatives E and G. Alternative A (No Action) and NC (No Change) are not shown in this table because, by definition, they are not departures. All of the departure alternatives call for timber harvests above the long-term sustained yield capacity in the first few decades. In later decades, harvests decline, but not below long-term sustained yield capacity.

4. How Alternative NC Differs From the Others.

Before proceeding with a description of the design objectives and criteria of individual alternatives, it is instructive to gain a legal perspective regarding the No Change alternative. It is also important to know how Alternative NC, the No Change alternative, differs from the other alternatives, including Alternative A, the No Action alter-

native, regarding data used to determine land suitability for timber production, tree growth data, and data regarding the conversion of logs to boards.

a. Alternative NC (No Change) - Legal Perspective.

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

36 CFR 219.14 - Timber resource land suitability: requires identification of land not suited for timber production based on risk of irreversible resource damage, lack of assurance of reforestation within five years, withdrawal by Act of Congress, Secretary of Agriculture, or Chief of the Forest Service.

36 CFR 219.27 - Identifies specific management requirements to be used in the development, analysis, approval, implementation, monitoring and evaluation of forest plans for activities including: silvicultural practices, resource protection, vegetative manipulation, protection of fish habitat and water quality areas, protection of soil and water, and maintenance of plant and animal diversity.

It is evident that the No Change alternative could not be implemented or used in future management of the Forest under the Forest Plan without Congressional and/or Secretary of Agriculture action to change the above laws or regulations.

b. Alternative NC (No Change) - Differences in Data Used.

NOTE: In the following discussion various terms, such as "unregulated", appear within quotation marks. These terms were applicable ten years ago when the existing Timber Management Plan was implemented and are defined in the Final Environmental Impact Statement for the Timber Management Plan of the Mt. Hood National Forest, document USDA-FS-R6-FES(Adm)-76-14.

These terms are no longer used and do not appear in the glossary of this DEIS.

1. Tentatively suitable land

A new study of acres tentatively suitable for timber production was completed in July 1984. The study resulted in the finding that 647,000 acres are tentatively suitable for timber production. This is the tentatively suitable land base for all alternatives (including the No Action alternative, Alternative A), except for Alternative NC, presented in this DEIS.

The definition of "commercial forest land" is roughly equivalent to tentatively suitable land. Therefore, the 753,000 acre land base for Alternative NC roughly corresponds to the 647,000 tentatively suitable acres used as the starting land base for development of all the other alternatives addressed in this DEIS. The reasons for the 106,000 acre difference between the "commercial forest land" base used for the Alternative NC and the "tentatively suitable" base used for the other alternatives are explained below. This difference largely accounts for the inability of Alternative A (No Action) or any other alternative to produce sustained levels of timber equal to that of the existing Timber Management Plan as adjusted to date; i.e., Alternative NC.

The following are some of the reasons why the 1984 land classification study found these "commercial forest land" acres to now be unsuitable for timber production: (1) The 1984 study used more specific methods for mapping and determining soil characteristics and capabilities. The Timber Management Plan process used a plot-sample inventory whereas the current study used an in-place data base using recent Soil Resource Inventory, stand examinations, and geological information. (2) This site specific information was further verified with ground checks by Ranger District personnel and members of the ID Team. (3) NFMA and the resulting regulations clarified the need to (a) assure regeneration within 5 years and (b) protect the land from irreversible damage. Since records do not exist regarding the specific location of unsuitable acres relative to the Timber Management Plan, only inferences can be made as to the nature of the 106,000 acre difference:

About 28,000 acres are now considered unsuitable because regeneration is not assured; another 28,000 acres are now considered unsuitable because of the potential of irreversible resource damage. The remaining 50,000 acre difference is assumed to relate to differences in processes and definitions.

2. Suitable land

The existing Timber Management Plan was initially implemented in 1977. It recognized 824,000 acres of "standard", "special", "marginal" and "unregulated" "commercial

forest land". The "unregulated" component comprised 71,000 acres, most of which eventually became Wilderness, unsuitable under current definitions. The remaining 753,000 acres were in the regulated base as of 1977, resulting in a total potential yield of 387 MMBF/yr (assuming no chargeable harvest from the Bull Run, even though acres for this area were included in the 753,000 figure). Since 1977, the Timber Management Plan has been adjusted with respect to the Bull Run (Public Law 95-200), officially approved Unit Plans, and the 1984 Oregon Wilderness Act. This has resulted in an available commercial land base of 656,000 acres and an equivalent ASQ of 356 MMBF/year. Table II-6 summarizes the preceding discussion.

As discussed earlier, the timber suitability study underlying Alternatives A thru I, leading to the 647,000 acre land base determination, was based on more specific and accurate methods than those which underlie Alternative NC's land base of 753,000 acres. The difference of 106,000 acres is the main reason why the harvest drops 32 percent, 356 to 243 MMBF, between Alternatives NC and A, even though both have the same land allocations aside from MMRs. This is confirmed by other statistics. The difference in the inventories of trees in Alternative NC (3860 MMCF) and Alternative A (2867 MMCF) is 26 percent. The difference in the alternatives' respective LTSYCs (65.1 MMCF versus 46.9 MMCF) is 28 percent. The difference in tentatively suitable acres, therefore, is also the reason for the differences in inventories and long-term sustained yield capacities.

5. Alternatives Considered in Detail.

The alternatives offer a wide range of approaches to managing the Mt. Hood National Forest. Each alternative responds in a different way to the Public Issues. The next section of this chapter discusses alternatives in relation to those Public Issues. Chapter I and Appendix A, DEIS, furnish additional details about the Public Issues.

Management areas for the different kinds of management objectives and activities have been identified for each alternative. These management areas are shown on maps included as part of this DEIS. They represent the definition of the alternative as it would appear on the ground. Standards are written for each management area and are intended to accomplish management objectives for the management area and to mitigate any potential effects of management activities.

There are also management direction and standards that apply Forest-wide and are common to all alternatives. In general these Forest-wide standards are required for compliance with minimum management requirements (MMRs) of 36 CFR 219.27, discussed earlier in this

Table II-6

Comparison Of The Existing Timber Management Plan (Alternative NC) To The No Action Alternative's (Alternative A's) Suitable Base and Harvest

Withdrawals under present planning procedures have occurred in a different order than in the TM Plan. In addition, MMRs are reflected in Alternative A and not in NC, and the two Alternatives' suitable landbases are different. For these reasons, the acres shown in this table for the Bull Run and for the Unit Plans are different for Alternatives NC and A.

	ALTERNATIVE NC		ALTERNATIVE A	
	M Acres	MMBF/Yr	M Acres	MMBF/Yr
Total National Forest acres	1059		1059	
Unsuitable for timber management	-235		-412	
Tentatively suitable acres	824	500	647	348
Unregulated acres as of 1977 (includes then existing unit plans)	-71			
Subtotal	753	442 ^{1/}	647	348
Minimum Management Requirements			-39	
Bull Run	-68		-46	
Unit Plans ^{2/}	-29		-37	
Land base under Current Direction	656	384	525	243
Adjustment to TM Plan to reflect management intensity		-23		
Reduction in salvage volume included in the TM Potential Yield, but not in the ASQ		-5		
After adjustments: Suitable Acres Comparable ASQ	656	356	525	243

1/The potential yield shown in the TM Plan is 387 MMBF and does not reflect volume from the Bull Run Watershed.

2/The 29,000 acres corresponding to Alternative NC pertain to Unit Plan adjustments to the TM Plan since 1977. The 37,000 acres corresponding to Alternative A refer to all unit plans (before and since

chapter, or were adopted from the Regional Guide. Others were developed specifically to respond to the environmental conditions on the Forest. Some mitigation activities are mentioned in the alternative descriptions in this chapter, however specific mitigation techniques depend on site characteristics and needs. Examples of these are included in the discussion of environmental consequences in Chapter IV. Management areas and the management objectives for each area are summarized at the end of this section of Chapter II. The inputs, in terms of acres per management area, are shown in Table II-8, Section F, Management Areas. Forest wide and management areas standards are presented in detail in Chapter Four of the accompanying Land and Resource Management Plan (Forest Plan).

The alternatives have some guiding principles in common to make sure they can be implemented. For example, they include a requirement that fluctuations in timber volume be limited to a maximum of 25 percent between decades of the plan. They also require that chargeable harvest of timber stands would not occur before they have reached 95 percent of culmination of

mean annual increment (CMAI). Refer to the glossary for a definition of CMAI.

The following pages provide descriptions of the alternatives selected for detailed consideration. They state the objectives of the alternative, discuss the management program activities designed to accomplish the alternative's objectives, and describe the responsiveness of the alternative to the Public Issues. In these descriptions, timber volume has been defined in different terms. Allowable sale quantity (ASQ) is volume that meets specific size and quality requirements, and is removed at the time of a sale of live green timber. ASQ, green, represents live trees, and total ASQ includes dead and dying trees that are present within the sale area. Total harvest volume is called timber sale program quantity (TSPQ). It includes additional volume that may not meet size and quality requirements, or may be dead or dying, but comes from outside of a given sale area. ASQ is the basis of planning annual harvest activities. TSPQ is an estimate of the total volume that could result from these activities.

a. Alternative NC (No Change).

The No Change alternative is developed in response to decisions made regarding an appeal brought by the Northwest Forest Resource Council. It represents the existing Timber Management Plan (TM Plan), and consequently does not comply with all provisions of the National Forest Management Act (NFMA) and regulations promulgated by the Secretary of Agriculture. Current management is interpreted as the combination of existing Unit Plans and district Multiple Use Plans for specific areas of the Forest, and individual resource plans, including the Timber Management Plan. Current plans do not specifically recognize the requirements to maintain viable populations of animals or the management of more than 4,700 acres for fish habitat and water quality purposes. Because this alternative does not reflect NFMA's timber land suitability criteria, it devotes more land to timber harvest than any other alternative including land currently considered unsuitable for timber production. This alternative does not reflect changes in Public Issues and management concerns that have surfaced since the existing plans were developed; however, it permits a variety of existing uses to continue. In accordance with the existing TM Plan, annual harvest will be 356 million board feet.

Timber Public Issue

Offer 3.56 billion board feet of timber per decade (comparable Allowable Sale Quantity) in perpetuity. Incorporate the existing Timber Management Plan, adjusted to 1984. Emphasize current silvicultural practices (planting, thinning, and clear-cutting). Use information regarding land suitability, yields, and utilization standards derived in 1977.

Fish Habitat and Water Quality Public Issue

Minimize reductions in riparian resource (fish habitat, water quality, etc.) capability.

Objectives are met through aggressive application of the TM Plan's Streamside Management Unit and Special Wildlife Habitat (wetlands) direction, as well as very high mitigation/rehabilitation investments (relative to other alternatives).

Wildlife Public Issue

Coordinate with other types of management to assure habitat during the next 50 years for about 35 pairs of spotted owls.

Recreation Public Issue

A "standard" level of service is to be provided. This is intended to meet the demands of the public in a manner which is responsive to changing desires over time relative to the quality of recreational services and facilities provided. Assure that at least 12 of the Forest's 48 most sensitive viewsheds do not appear more than slightly altered in 50 years. Maintain the ability to supply at least 8,000 semi-primitive motorized and 61,000 semi-primitive nonmotorized RVDs through the year 2030.

Unroaded Areas Public Issue

Harvest may occur at any time in the following areas: Wind Creek, Twin Lakes, Bull of the Woods, Mt. Hood Additions, Salmon/Huckleberry, and Badger/Jordan. Harvest or other types of development requiring roading may not take place at any time in the following areas: Eagle, Olallie, Larch, and Roaring River.

Communities Public Issue

The response to communities' needs is implicit in the way this alternative responds to the other Public Issues.

Other Criteria

Wilderness, Special Interest Areas, Research Natural Areas, and Wild, Scenic, and Recreational Rivers

Recommend the following for designation under the Wild and Scenic River System: The Roaring River and the Salmon River. Retain all existing Special Interest Areas (SIAs) and Research Natural Areas (RNAs) and establish the following new ones:

Additional Special Interest Areas

Face of the Columbia Gorge

Roaring River

Bagby Hot Springs

Squaw Meadows

Mill Creek Buttes

Additional Research Natural Areas

Big Bend

Bull Run Additions

b. Alternative A (No Action)

Alternative A is designed to present estimates of the outputs and effects of managing the Forest under current plans and practices, adjusted as required by new laws and regulations, including meeting the MMRs for wildlife species and soil and water resources, and incorporating new timber suitability criteria.

Alternative A will permit a variety of existing uses to continue, including present timber management practices. This alternative projects results of managing in the future without regard to Public Issues or management concerns that have arisen since existing plans were approved, aside from the MMRs. The cost of Alternative A is within existing budget requests.

Timber Public Issue

Produce the highest amount of timber possible, given the following: a harvest policy of nondeclining flow, existing land allocations plus MMRs, and existing silvicultural preferences (emphasizing planting, thinning, and clearcutting). For this and all remaining alternatives, use current data regarding land suitability, yields, and utilization standards.

Fish Habitat and Water Quality Public Issue

Maintain forest-wide riparian resource (fish habitat, water quality, etc.) capability at or near present levels.

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

Wildlife Public Issue

Coordinate with other types of management to assure habitat during the next 50 years for about 80 pairs of spotted owls, about 102 pileated woodpeckers, and about 231 pine martens.

Recreation Public Issue

A "standard" level of service is to be provided. This is intended to meet the demands of the public in a manner which is responsive to changing desires over time relative to the quality of recreational services and facilities provided. Assure that at least 16 of the Forest's 48 most sensitive viewsheds do not appear more than slightly altered in 50 years. Maintain the ability to supply at least 7,000 semi-primitive motorized and 59,000 semi-primitive nonmotorized RVDs through the year 2030.

Unroaded Area Public Issue

During the next 15 years, harvest timber in the Mt. Hood Additions, Salmon/Huckleberry and Badger/Jordan areas. After 15 years, harvest timber in the Wind Creek, Twin Lakes, and Bull of the Woods areas. Do not road the Eagle, Olallie, Larch, or Roaring River areas at any time.

Communities Public Issue

The response to communities' needs is implicit in the way this alternative responds to the other Public Issues.

Other Criteria

Wilderness, Special Interest Areas, Research Natural Areas, and Wild, Scenic, and Recreational Rivers

Recommend the following for designation under the Wild and Scenic River System: The Roaring River and the Salmon River. Retain all existing SIAs and RNAs and establish the following new ones:

Additional Special Interest Areas

Face of the Columbia Gorge

Roaring River

Bagby Hot Springs

Squaw Meadows

Mill Creek Buttes

Additional Research Natural Areas

Big Bend

Bull Run Addition

c. Alternative B (RPA)

Alternative B is designed to respond to RPA objectives, and responds most strongly to the public issue of timber supply. Under this alternative, the Forest would be managed to meet a timber production goal of 376 million board feet net merchantable timber per year. This alternative departs from nondeclining flow of timber and harvests more than its long-term sustained yield capacity to provide this timber supply for the 50-year RPA planning horizon. It also provides a program mix that addresses RPA targets for other resources such as wildlife, range and developed recreation. The Bull Run Municipal Watershed would be managed according to the Bull Run Planning Unit EIS for the production of potable water. Management of recreational opportunities would emphasize the use of existing and new roads for dispersed motorized recreation, and the use of developed sites such as campgrounds.

Timber Public Issue

Produce an average of 376 MMBF/year (TSPQ) for the next fifty years, provided that the LTSYC of this alternative is equalled or exceeded every decade (see the Glossary for a definition of LTSYC) and harvest levels do not drop more than 20 percent from decade to decade. Manage timber intensively, using practices such as planting and thinning.

Fish Habitat and Water Quality Public Issue

Maintain forest-wide riparian resource (fish habitat, water quality, etc.) capability at or near present levels. Objectives are met through MMR level riparian Management Areas and a mitigation/rehabilitation program at a high annual investment level as compared to other alternatives.

Wildlife Public Issue

Coordinate with other types of management to assure habitat during the next 50 years for about 80 pairs of spotted owls, about 102 pileated woodpeckers, and about 231 pine martens. Mitigate potential adverse effects due to increased timber harvests.

Recreation Public Issue

A "standard" level of service is to be provided. This is intended to meet the demands of the public in a manner which is responsive to changing desires over time relative to the quality of recreational services and facilities provided.

Assure that at least 7 of the Forest's 48 most sensitive viewsheds do not appear more than slightly altered in 50 years. Maintain the ability to supply at least 3,000 semi-primitive nonmotorized RVDs through the year 2030.

Unroaded Areas Public Issue

Defer timber harvests in the Eagle area for 15 years. Harvest timber in the other 9 areas during the first 15 years.

Communities Public Issue

The response to communities' needs is implicit in the way this alternative responds to the other Public Issues.

Other Criteria

Wilderness, Special Interest Areas, Research Natural Areas, and Wild, Scenic, and Recreational Rivers

Retain all existing RNAs. Retain all existing SIAs except for Olallie Lake which is made available for timber harvest.

d. Alternative C

This alternative is developed in response to the Public Issues concerning adequate timber supplies and community stability. It would provide maximum timber harvests during the next thirty years consistent with resource protection provided by minimum management requirements.

Alternative C is designed to come as close as possible to meeting the objectives of the Forestry Program For Oregon (FPFO), proposed by the Oregon Department of Forestry which is 113.3 MMCF (565 MMBF) for the first decade. Under Alternative C all land suitable for growing trees would be managed for intensive timber production. Timber harvesting would be on a regularly scheduled basis in the Bull Run Watershed. For the first thirty years, timber harvesting would be above the long-term sustained yield capacity of this alternative. This represents a departure from nondeclining flow of timber.

Timber Public Issue

Subject to the following constraints, produce as much timber as possible during the next 30 years. The LTSYC of the Forest is to be equalled or exceeded every decade and harvest levels are not to drop more than 25 percent from decade to decade. Manage timber intensively, using such practices as planting and thinning.

Fish Habitat and Water Quality Public Issue

Except for the Bull Run Watershed, objectives will be met in the same manner as described for Alternative B. The Bull Run will be managed intensively for timber production.

Wildlife Public Issue

Coordinate with other types of management to assure habitat during the next 50 years for about 80 pairs of spotted owls, about 102 pileated woodpeckers, and about 231 pine martens. Mitigate potential adverse effects due to increased timber harvests.

Recreation Public Issue

A "standard" level of service is to be provided. This is to meet the demands of the public in a manner which responds to changing desires over time relative to recreational services and facilities provided. Assure that at least 7 of the Forest's 48 most sensitive viewsheds do not appear more than slightly altered in 50 years. Maintain the ability to supply at least 3,000 semi-primitive non-motorized RVDs through the year 2030.

Unroaded Areas Public Issue

Defer harvests in the Eagle area for 15 years. Intensively harvest timber in the other 9 areas during the first 15 years.

Communities Public Issue

The response to communities' needs is implicit in the way this alternative responds to the other Public Issues.

Other Criteria

Wilderness, Special Interest Areas, Research Natural Areas, and Wild, Scenic, and Recreational Rivers

Retain all existing RNAs and SIAs except for Olallie Lake which is made available for timber harvest.

e. Alternative D

This alternative is structured to address important non-timber Public Issues and management concerns while producing a timber harvest in the first ten years that does not adversely affect local communities. This requires a departure from nondeclining flow of timber. Alternative D differs from others developed in response to the Public Issue on timber supply by placing primary emphasis on the first decade. It has been designed to maintain near-current levels of timber production by harvesting above the alternative's LTSYC during the first decade. This alternative would support local timber-dependent communities, while responding in some degree to Public Issues on recreation, wildlife, fish and water quality. Among the other resources emphasized in this alternative are selected SIAs, travel corridors of exceptional scenic value, watersheds needed to maintain anadromous fish populations, and the Bull Run Municipal Watershed.

Timber Public Issue

Produce about 384 MMBF/year (TSPQ) of timber for the next 10 years. The LTSYC of the alternative is to be equalled or exceeded every decade and harvest levels are not to drop more than 25 percent from decade to decade. Intensive timber management practices such as planting and thinning should usually be employed.

Fish Habitat and Water Quality Public Issue

Maintain forest-wide riparian resource (fish habitat, water quality, etc.) capability at or near present levels. Aggressively pursue opportunities to provide local long term increases in riparian resource productive capability.

These objectives are accomplished through: 1) land allocations to riparian management areas beyond MMR levels: i.e., Special Emphasis Watershed designation for the City of The Dalles, and for the 15-Mile Creek and Still Creek watersheds, and 2) application of a mitigation/rehabilitation program of moderate intensity and investment relative to other alternatives.

Wildlife Public Issue

Coordinate with other types of management to assure habitat during the next 50 years for about 85 pairs of spotted owls, about 102 pileated woodpeckers, and about 231 pine martens. Manage the Pine/Oak area for wildlife species dependent on this type of habitat. Make intensive efforts to mitigate potential adverse effects of harvesting timber.

Recreation Public Issue

A "standard" level of service is to be provided. This is intended to meet the demands of the public in a manner which is responsive to changing desires over time relative to the quality of recreational services and facilities provided. Assure that at least 20 of the Forest's 48 most sensitive viewsheds do not appear more than slightly altered in 50 years. Maintain the ability to supply at least 8,000 semi-primitive motorized and 54,000 semi-primitive nonmotorized RVDs through the year 2030.

Unroaded Areas Public Issue

Harvest timber in the following areas during the next 15 years: Wind Creek, Twin Lakes, Bull of the Woods, Mt. Hood Additions, Salmon/Huckleberry, Badger/Jordan, and half of the Larch area. Do not road or harvest timber in the other half of the Larch area or any of the Eagle, Olallie, or Roaring River areas at any time.

Communities Public Issue

The response to communities' needs is implicit in the way this alternative responds to the other Public Issues.

Other Criteria

Wilderness, Special Interest Areas, Research Natural Areas, and Wild, Scenic, and Recreational Rivers

Recommend the following for classification under the Wild and Scenic River System: The Clackamas and Salmon Rivers. Retain all existing SIAs and RNAs and establish the following new ones:

Additional Special Interest Areas

Face of the Columbia Gorge

Larch Mountain

Mitchell Flats/Roaring River

Olallie Lake Expansion

Bagby Hot Springs

Barlow Road

Little Crater Lake Expansion

Lost Lake

Parkdale Lava Beds

Sugar Pine

Additional Research Natural Areas

None

f. Alternative E (Preferred)

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

Timber Public Issue

Produce as much timber as possible during the first decade, given the land allocations derived from current plans, new legal requirements and recently identified Public Issues and management concerns. Do not reduce harvests more than 25 percent per decade and maintain harvests at or above LTSYC every decade. Generally, use intensive practices such as planting and thinning where economically efficient to do so.

Fish Habitat and Water Quality Public Issue

Provide for modest, long-term increases in Forest-wide riparian resource (fish habitat, water quality, etc.) capabilities.

In addition to a mitigation and rehabilitation program of moderate annual investment levels, a Forest-wide enhancement program is initiated at highest priority sites. These programs complement riparian area management above the MMR level similar to those described in Alternative D.

Due to accelerated timber harvest schedules, estimated increases in riparian resource capability will necessitate demanding planning and maintenance of rehabilitation and enhancement projects and may require extended time periods for improvements to become evident.

Wildlife Public Issue

Coordinate with other types of management to assure habitat during the next 50 years for about 85 pairs of spotted owls, about 102 pileated woodpeckers, and about 231 pine martens. Manage Pine/Oak areas to meet the needs of wildlife dependent on this type of habitat. Intensify efforts to mitigate potential adverse effects of accelerated timber harvest.

Recreation Public Issue

Provide a "standard" level of service in order to meet the demands of the public in a manner which is responsive to changing desires. Assure that at least 31 of the Forest's 48 most sensitive viewsheds do not appear more than slightly altered in 50 years. Maintain the ability to supply at least 9,000 semi-primitive motorized and 75,000 semi-primitive nonmotorized RVDs through the year 2030.

Unroaded Areas Public Issue

During the next 15 years harvest timber in half of the Larch and Wind Creek areas. Also during the next 15 years harvest in all of the Twin Lakes, Bull of the Woods, Salmon Huckleberry, Mt. Hood Additions, and Badger Jordan areas. All other areas are to remain undeveloped during the entire planning horizon.

Communities Public Issue

The response to communities' needs is implicit in the way this alternative responds to the other Public Issues.

Other Criteria

Wilderness, Special Interest Areas, Research Natural Areas, and Wild, Scenic, and Recreational Rivers

Recommend the following for classification under the Wild and Scenic River System: The Clackamas, Salmon, and Roaring Rivers. Retain all existing SIAs and RNAs and establish the following new ones:

Additional Special Interest Areas

Face of the Columbia Gorge

Larch Mountain

Mitchell Flats/Roaring River

Olallie Lake Expansion
Bagby Hot Springs
Barlow Road
Little Crater Lake Expansion
Lost Lake
Parkdale Lava Beds
Squaw Meadows
Sugar Pine

Additional Research Natural Areas

Big Bend
Bull Run Addition
Gumjuwac-Tolo

g. Alternative F

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

Timber Public Issue

Produce as much timber as is economically feasible. Use intensive management practices such as planting and thinning only where economically efficient to do so.

Fish Habitat and Water Quality Public Issue

Provide for significant, long-term increases in Forest-wide riparian resource (fish habitat, water quality, etc.) capabilities.

This is accomplished through major, additional riparian area allocations, application of an aggressive program to eliminate the backlog of rehabilitation projects and active pursuit of most enhancement opportunities.

Wildlife Public Issue

Increase wildlife habitat for old growth dependent species above the minimum level, i.e. the MMR level. Coordinate with other types of management to assure habitat during the next 50 years for about 101 pairs of

spotted owls, about 133 pileated woodpeckers, and about 300 pine martens. Manage Pine/Oak area to meet the needs of wildlife which require such habitat.

Recreation Public Issue

A "standard" level of service is to be provided. This is intended to meet the demands of the public in a manner which is responsive to changing desires over time relative to the quality of recreational services and facilities provided. Assure that at least 46 of the Forest's 48 most sensitive viewsheds do not appear more than slightly altered in 50 years. Maintain the ability to supply at least 13,000 semi-primitive motorized and 105,000 semi-primitive nonmotorized RVDs during the year 2030.

Unroaded Areas Public Issue

Harvest timber in the Olallie, Twin Lakes, Mt. Hood Additions, Salmon/Huckleberry, and Badger/Jordan areas during the next 15 years. Subsequently harvest in half of the Larch area and all of the Wind Creek area. Refrain from harvesting in the other half of the Larch area or any of the Eagle, Roaring River, or Bull of the Woods areas at any time.

Communities Public Issue

The response to communities' needs is implicit in theay this alternative responds to the other public issues.

Other Criteria

Wilderness, Special Interest Areas, Research Natural Areas, and Wild, Scenic, and Recreational Rivers

Recommend the following for classification under the Wild and Scenic River System: The Clackamas and Salmon Rivers. Retain all existing SIAs and RNAs, with the exception of the Olallie Scenic Area. Add the following:

Additional Special Interest Areas

Face of the Columbia Gorge
Larch Mountain
Barlow Road
Lost Lake
Parkdale Lava Beds
Squaw Meadows
Sugar Pine

Additional Research Natural Areas

Big Bend
Bull Run Addition
Gumjuwac-Tolo

h. Alternative G

This alternative is designed to respond moderately well to all public issues. Public Issues related to water quality, fish, wildlife, recreation and unroaded resources would be addressed under the current planned objectives and guidelines on most areas of the Forest. This is intended to assure that the most important areas have been selected to manage for these resources. This alternative manages the land for the same uses as Alternative E. However, it schedules timber harvests on the basis of nondeclining yield. It does so to maintain options to respond in the future to other Public Issues related primarily to unroaded areas and wildlife habitat.

NOTE: The opportunity for increasing the first decade volume above LTSYC from this land base by departing from nondeclining flow is discussed in Alternative E.

Timber Public Issue

Produce as much timber as is economically feasible, given the policy of nondeclining flow and the land allocations reflecting current management, MMRs, and other selected areas. Use intensive management practices such as planting and thinning only where economically efficient to do so.

Fish Habitat and Water Quality Public Issue

Provide for modest, long-term increases in Forest-wide, riparian resource (fish habitat, water quality, etc.) capability.

This will be accomplished through means similar to those discussed in Alternative E. Rehabilitation and enhancement project planning requirements, however, are less demanding and increases in riparian resource capability are likely in shorter time periods than those for Alternative E.

Wildlife Public Issue

Coordinate with other types of management to assure habitat during the next 50 years for about 85 pairs of spotted owls, about 102 pileated woodpeckers, and about 231 pine martens. Manage the Pine/Oak area for wildlife purposes. Intensify efforts to mitigate potential adverse effects of timber harvest.

Recreation Public Issue

A "standard" level of service is to be provided. This is intended to meet the demands of the public in a manner which is responsive to changing desires over time relative to the quality of recreational services and facilities provided. Assure that at least 31 of the Forest's 48 most sensitive viewsheds do not appear more than slightly altered in 50 years. Maintain the ability to supply at least 9,000 semi-primitive motorized and 75,000 semi-primitive nonmotorized RVDs through the year 2030.

Unroaded Areas Public Issue

Harvest timber in Bull of the Woods, Mt. Hood Additions, Salmon Huckleberry, and Badger/Jordan areas during the next 15 years. Subsequently harvest in all of the Twin Lakes area and in half of the Larch area and half of the Wind Creek area. Refrain from harvesting or otherwise developing the other halves of the Larch and Wind Creek areas, or any of the Eagle, Roaring River, or Olallie areas at any time.

Communities Public Issue

The response to communities' needs is implicit in the way this alternative responds to the other Public Issues.

Other Criteria

Wilderness, Special Interest Areas, Research Natural Areas, and Wild, Scenic, and Recreational Rivers

Recommend the following for classification under the Wild and Scenic River System: The Clackamas, Salmon, and Roaring Rivers. Retain all existing SIAs and RNAs and establish the following new ones:

Additional Special Interest Areas

Face of the Columbia Gorge

Larch Mountain

Mitchell Flats/Roaring River

Olallie Lake Expansion

Bagby Hot Springs

Barlow Road

Little Crater Lake Expansion

Lost Lake

Parkdale Lava Beds

Squaw Meadows

Sugar Pine

Additional research natural areas

Big Bend

Bull Run Addition

Gumjuwac-Tolo

i. Alternative H

This alternative is developed to supply recreational opportunities in primitive or natural settings, away from roads and other major evidence of human activity. It precludes future development in all presently unroaded areas, and in places on the Forest adjacent to Wildernesses and unroaded areas that also offer primitive and semi-primitive nonmotorized recreation opportunities. Alternative H would also preserve existing old growth timber stands as a diminishing biological and cultural

resource. Retaining old growth would provide complementary benefits for fish and wildlife habitats, and maintain or improve scenic quality. Timber would be harvested only in areas where it has been removed in the past, and where it would not conflict with the needs of dispersed recreational activities.

Timber Public Issue

Harvest timber only in areas where it has been cut in the past, provided that these harvests will not conflict with other resource objectives. Use intensive management practices such as planting and thinning only where it is economically efficient to do so.

Fish Habitat and Water Quality Public Issue

Provide for significant, long-term increases in Forest-wide riparian resource (fish habitat, water quality, etc.) capability.

This is accomplished through a rehabilitation and enhancement program similar to that described for Alternative F, and substantial increases in land allocations to riparian resource management and to uses compatible with riparian resource management (visual management, unroaded recreation, etc.)

Wildlife Public Issue

Increase habitat for old growth dependent species to the maximum level. Coordinate with other types of management to assure habitat during the next 50 years for about 148 pairs of spotted owls, about 102 pileated woodpeckers, and about 231 pine martens. Manage the Pine/Oak area to meet the needs of wildlife which depends on this habitat.

Recreation Public Issue

A "standard" level of service is to be provided. This is intended to meet the demands of the public in a manner which is responsive to changing desires over time relative to the quality of recreational services and facilities provided. Assure that at least 44 of the Forest's 48 most sensitive viewsheds do not appear more than slightly altered in 50 years. Maintain the ability to supply at least 28,000 semi-primitive motorized and 206,000 semi-primitive nonmotorized RVDs through the year 2030. Maintain existing opportunities by prohibiting further development in areas adjacent to some unroaded areas and Wilderness.

Unroaded Areas Public Issue

Maintain the unroaded, amenity-oriented characteristics of all ten existing unroaded areas.

Communities Public Issue

The response to communities' needs is implicit in the way this alternative responds to the other Public Issues.

Other Criteria

Wilderness, Special Interest Areas, Research Natural Areas, and Wild, Scenic, and Recreational Rivers

Recommend the following rivers for classification under the Wild and Scenic River System: The Clackamas and Salmon Rivers. Retain all existing SIAs and RNAs and establish the following new ones:

Additional Special Interest Areas

Face of the Columbia Gorge

Bagby Hot Springs

Barlow Road

Parkdale Lava Beds

Additional Research Natural Areas

Big Bend

Bull Run Addition

Gumjuwac-Tolo

j. Alternative I

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

Timber Public Issue

Harvest only in areas where timber these harvests will not conflict with other resource objectives. Use intensive management practices such as planting and thinning where it is economically efficient to do so.

Fish Habitat and Water Quality Public Issue

Provide for substantial, long-term increases in Forest-wide riparian resource (fish habitat, water quality, etc.) capability.

This is accomplished through selection of a maximum level of riparian management area allocations, application of an aggressive program to quickly eliminate the backlog of rehabilitation projects and active pursuit of all available enhancement opportunities.

Wildlife Public Issue

Maintain old growth area and distribution above MMR levels. Coordinate with other types of management to assure habitat during the next 50 years for about 120 pairs of spotted owls, about 163 pileated woodpeckers, and about 369 pine martens. Manage Pine/Oak areas to meet wildlife needs.

Recreation Public Issue

A "standard" level of service is to be provided. This is intended to meet the demands of the public in a manner which is responsive to changing desires over time relative to the quality of recreational services and facilities provided. Assure that at least 47 of the Forest's 48 most sensitive viewsheds do not appear more than slightly altered in 50 years. Maintain the ability to supply at least 20,000 semi-primitive motorized and 157,000 semi-primitive nonmotorized RVDs through the year 2030.

Unroaded Public Issue

Maintain the unroaded, amenity-oriented characteristics of all ten existing unroaded areas.

Communities Public Issue

The response to communities' needs is implicit in the way this alternative responds to the other Public Issues.

Other Criteria

Wilderness, Special Interest Areas, Research Natural Areas, and Wild, Scenic, and Recreational Rivers

Recommend that the unroaded portion of the Olallie Lake Area be designated as Wilderness. Recommend the following rivers for classification under the Wild and Scenic River System: The Clackamas, Salmon, White, and Roaring Rivers. Retain all existing SIAs and RNAs and establish the following new ones:

Additional Special Interest Areas

Face of the Columbia Gorge

Larch Mountain

Mitchell Flats/Roaring River

Olallie Lake Expansion

Bagby Hot Springs

Barlow Road

Clackamas Lake Ranger Station ^{1/}

Cloud Cap/Tilly Jane Historical Area ^{1/}

Little Crater Lake Expansion

Lost Lake

Parkdale Lava Beds Squaw Meadows

Sugar Pine

Additional Research Natural Areas

Big Bend

Bull Run Addition

Gumjuwac-Tolo

6. Management Areas

As explained earlier in this chapter, a primary means of meeting the objectives of an alternative is to assign specific geographic areas of the Forest to be managed in accordance with selected standards. This process is referred to as "allocating acres to management areas". Management area allocations are shown on the alternative maps and the supplementary wildlife resource map accompanying this document. The management areas developed by the Forest are grouped into three categories according to the type and degree of planned development for each area. These categories, labeled A, B, and C, represent broad differences in the use, intensity and objectives for each area. These categories are described on the following pages.

a. Category A

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

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

^{1/} These two areas are not designated as SIAs in any other alternative..

The Category A Management Areas are as follows:

DESIGNATION	AREA NAME
A1	Bull Run Planning Unit ^{1/}
A2	Wilderness
A3	Research Natural Areas
A4	Special Interest Areas
A5	Unroaded Rec. -no Timber Harvest
A6	Roaded Rec. -no Timber Harvest
A7	Old Growth
A8	Northern Spotted Owl Habitat Areas
A9	Key Site Riparian Habitat
A10	Developed Recreation Sites
A11	Winter Recreation Areas
A12	Outdoor Education Areas

1/ Chargeable harvest occurs in the buffer zone as indicated in the existing Bull Run FEIS. However, the Bull Run drainage is subject only to nonchargeable harvesting if it is assigned to this Management Area (as is the case for all alternatives except for Alternative C).

It has been noted that one of the 10 alternatives considered in detail, Alternative NC, is based on management area designations which predate the management area development process. Alternative NC represents the Mt. Hood National Forest Timber Management Plan, which received final administrative approval on Feb. 22, 1978. The term "Streamside Management Unit" used in that Plan is similar to the "Key Site Riparian Habitat" term used in this DEIS. Other management area acre designations are harder to discern in the Ten Year Management Plan. For this reason, acreage estimates shown in this DEIS related to Alternative NC are less accurate than those shown for the other nine alternatives.

b. Category B

Management objectives in Category B Management Areas are designed to achieve specific resource objectives, as well as produce timber, while achieving an objective of promoting a healthy, growing forest, through timber management.

In order to achieve the stated resource management objectives for specific management areas in this category and to meet ASQ goals, chargeable timber harvest shall be scheduled in Category B Management Areas. Compared to Category C Management Areas, these management areas have additional restrictions regarding rate of harvest, sizes of openings, and minimum rotations: i.e., how old a timber stand is before it is harvested. It is es-

timated these additional restrictions have the effect of reducing potential timber harvests by as much as two-thirds of that expected from Category C Management Areas. Site specific conditions may require more restricted timber harvest or no timber harvest activities to occur in particular geographic areas during a given decade, while in other areas more timber harvesting may occur in order to achieve the overall timber harvest goal. The individual Category B Management Areas are as follows:

DESIGNATION	AREA NAME
B1	Wild, Scenic & Recreation Rivers ^{1/}
B2	Scenic Viewsheds
B3	Roaded Rec.-reduced Timber Harvest
B4	Pine/oak Habitat
B5	Pil. Woodpecker/Pine Marten Habitat
B6	Special Emphasis Watersheds
B7	General Riparian Areas
B8	Earth Flows
B9	Wildlife/visual Areas

1/Wild segments of Wild and Scenic Rivers have no chargeable timber harvest. Scenic and Recreational segments allow some chargeable timber harvest.

c. Category C

There is only one Category C Management Area, designated as area C1. Chargeable timber harvest is scheduled in this area as a dominant objective, while other outputs would be jointly produced. Management activities in area C1 are designed primarily to provide wood products needed to meet national demand, and to support local communities dependent on timber for employment, while achieving the objective of promoting a healthy, growing forest mosaic through timber harvest. These objectives are achieved while concurrently being sensitive to, and managing for, the other forest resource uses and values including transitory forage production and public recreation use. Timber harvest levels are based on capability and suitability of the land in accordance with applicable laws and regulations.

d. Salvaging Mortality (Dead and Dying Trees)

The focus of this discussion is on Category B and C Management Areas because it is estimated that less than 1 MMBF/yr will be salvaged from Category A Areas under any alternative. Salvage of old growth (trees 200 years or older) during the next 10 years is as follows:

1) Salvage Harvest in Category B Areas

The long rotations in Category B will result in more unsalvaged mortality being left per acre than in the Category C Management Area in order to:

- Provide dead and defective tree habitat to sustain viable populations of primary excavators in riparian and other areas.
- Maintain a minimum of two down logs per acre, each over 40 cubic feet in gross volume, to provide sufficient habitat quality and distribution to maintain dependent wildlife species.
- Maintain available dead and down woody debris for stream channel and stream bank stabilization and to act as a sponge to stabilize riparian areas during highwater cycles.
- Provide abundant large, dead, standing and down wood in Northern Spotted Owl Habitat Areas to support viable populations of owls, prey species and other old growth dependent wildlife species.
- Meet scenic quality objectives in Scenic Viewsheds and Wildlife/Visual Areas by maintaining a natural appearing forest and providing for dependent wildlife species that are viewed by Forest visitors.
- Maintain unique riparian ecosystems, high quality water, waterfowl breeding nesting and resting habitat, wildlife cover and nesting habitat, fish spawning and rearing habitat, and the habitat diversity that exists in Key Site Riparian Areas.
- Salvage streamside vegetation in Category B to minimize stream temperature increases, reduce turbidity, avoid accumulation of wood debris and lessen impacts of any activity on stream water quality.

Some salvage harvest is intended to come from the Category B Management Areas and is included in the ASQ. Some additional mortality, such as firewood and pulpwood not meeting utilization standards, will be salvaged from Category B Areas and comprise a component of the Timber Sale Program Quantity (TSPQ) which is not merchantable and does not contribute to the ASQ. An estimate of the disposition of mortality which meets utilization standards in Category B Management Areas is shown in the Table II-17.

Depending on the alternative, between 5 and 10 percent of gross mortality will be salvaged. Its species and composition is about the same as that which contributes to the Allowable Sale Quantity (ASQ). Salvage volume includes that which would be part of a sale of green timber, or would comprise a salvage sale.

Depending on the alternative, 30 to 45 percent of gross mortality will not be salvaged because it is not accessible from an economic standpoint.

This leaves 45 to 65 percent of the gross mortality unsalvaged in order to meet Category B multiple use objectives. This "reserved" volume eventually becomes unmerchantable. The rate of deterioration varies by species, climate, and other factors. An average of about ten years of accumulated salvageable material will exist at any given time.

Records regarding salvage sales on the Forest for the Fiscal Year 1987 show that only existing roads were used; no new ones were built solely to salvage trees. This is expected to be the case for any economically efficient salvaging to be done in the future, whether they are from Category B Management Areas or Category C Management Areas.

Table II-7

Harvest Of Dead And Dying Trees In Category B Areas

ACCOUNTING CATEGORY	MILLION BOARD FEET PER YEAR PER ALTERNATIVE (Only includes volume which meets utilization standards)									
	NC (No Change)	C	B (RPA)	D	E (Preferred)	G	A (No Action)	F	I	H
Gross Mortality, ^{1/}	55	18	16	21	24	24	12	30	30	14
To Be Salvaged	4	1	1	1	2	2	1	3	3	1
Not Salvaged:										
Not Accessible	18	8	5	7	8	8	4	6	9	5
Amount Reserved To Meet Category B Multiple Use Objectives	33	9	10	13	14	14	7	18	18	8
Approximate Salvage Value Of Amount Reserved For Other Uses (\$MM/Year)	\$1.8	\$0.6	\$0.5	\$0.7	\$0.8	\$0.8	\$0.4	\$1.1	\$1.1	\$0.5

1/ Variation in mortality is affected by the suitable land base.

(2) Salvage Harvest In Category C Areas

Approximately 20 percent of the gross mortality will be salvaged from Category C lands in any alternative. The unsalvaged mortality will:

- Provide dead and defective tree habitat to sustain viable populations of primary excavators.
- Maintain a minimum of two down logs per acre, each over 40 cubic feet in gross volume in to provide sufficient habitat quality and distribution to maintain dependent wildlife species.
- Manage salvageable streamside vegetation to minimize stream temperature increases, reduce turbidity, avoid accumulation of wood debris and lessen impacts of any activity on stream water quality.

e. Management Area Acreages

Table II-8 shows how the Forest's 1,059,400 acre land base is allocated among the management areas for the alternatives. Not all of the acres in Category B and C are suitable for timber production; suitable and unsuitable acres are rather homogeneously mixed in these areas (except in Alternative NC). The total amount of suitable acres in these two categories is noted at the bottom of Table II-8. This is further subdivided in Table II-9.

Table II-9 follows Table II-8 and shows how the alternatives' tentatively suitable land bases are allocated among the three categories of management areas. A land suitability map is included in the map packet that accompanies this document. When tentatively suitable areas are allocated to Category A Management Areas, they become unsuitable for timber management and so are listed in the table. Once allocated to Category B or C Management Areas, the tentatively suitable acres gain a designation of suitable. Note that Alternative NC begins with a 753,000 acre tentatively suitable land base, but the tentative base for the other alternatives is 647,200 acres.

f. Synopsis Of Objectives, Direction, and Programs

The detailed direction pertaining to each management area is presented in the Draft Forest Plan and Appendix D of this DEIS. The following is a highly condensed synopsis of this detail. It is intended to give a general impression of the objectives, direction, and programs related to the individual management areas.

(1) Category A

Management Area A1 - Bull Run Planning Unit

Goal: To serve as the main source water supply for the City of Portland and its service areas. To continue to produce "pure, clear, raw potable" water (for the City of Portland and its service areas) of a quantity and quality

that is at least as good as that historically produced; as defined by the Bull Run Water Quality Standards.

The dominant management objective is the continued production of "pure clear raw potable water" (91 Stat. 1425) for the City of Portland and other local governmental units.

Direction: Management direction for this area incorporates in its entirety the direction contained in pages 62-67 of the Bull Run Planning Unit Land Management Plan, USDA-FS-FES (ADMIN)-76-16, which is further described as the Preferred Alternative, Chapter V, pages 62-77. The FEIS was approved by the Regional Forester January 24, 1979.

Programs: Management programs are designed to reduce long-range risks to water quality. Water production is to be maintained at or above historical levels. Water quality will meet the Bull Run Water Quality Standards as defined in the Bull Run Planning Unit Final Environmental Impact Statement. Management activities within the buffer area of the Management Area (Planning Unit) include chargeable timber harvest and normal salvage operations. Nonchargeable timber harvest and salvage operations to protect the watershed are permitted within the physical watershed drainage if water quality standards can be met, or if it can be demonstrated the timber harvest is necessary for reducing the potential of catastrophic wild fires while maintaining the watershed's ability to withstand high-intensity rainstorms and runoff.

Management Area A2 - Wilderness

Goal: To provide for the primitive recreation opportunities, and ecological, scientific, geological, educational, scenic, and historical values of Wilderness in a manner that would leave each Wilderness unimpaired for use and enjoyment as wild country.

Direction: Management direction for Wilderness is to maintain the environment in an essentially unaltered and undisturbed state. Management allows natural ecological processes, including the natural role of fire, to operate with minimum human interference.

Programs: Management programs are designed to achieve the individual objectives of each Wilderness zone. Timber harvest, chargeable or nonchargeable, and salvage operations are not permitted in Wilderness. Zones within each Wilderness have been designated to conform to different recreation opportunities based on naturalness, solitude, and opportunities for challenge.

Three types of zones are found on the Forest: Transition, Semi-Primitive Trained, and Primitive Trained (refer to Chapter III, DEIS, Map III-16). The standards for Wilderness have management restrictions for limiting and distributing visitor use in each of these zones.

Table II-8

Acreage In Management Areas By Alternative

(Alternatives are listed left-to-right in accordance with most suitable acres in the timber base.)
(NE indicates Not Estimated)

MANAGEMENT AREA	A C R E S									
	NC NOCHANGE	C	B (RPA)	D	E PREFERRED	G	A NO ACTION	F	I	H
Category A										
A1-Bull Run ^{1/}	90,600	0	90,600	90,600	90,600	90,600	90,600	90,600	90,600	90,600
A2-Wilderness ^{2/}	185,300	185,300	185,300	185,300	185,300	185,300	185,300	185,300	193,400	185,300
A3-RNA ^{3/}	NE	1,300	1,300	1,300	1,300	1,300	1,650	1,200	1,050	1,300
A4-SIA	NE	50	50	52,750	54,950	54,950	58,250	22,850	38,850	26,000
A5-Unroaded Rec.	NE	0	0	1,500	5,950	5,950	0	39,000	49,700	80,950
A6-Roaded Rec.	NE	0	0	1,500	750	750	0	20,850	31,200	44,500
A7-Old Growth	NE	0	0	0	0	0	0	0	0	130,700
A8-Spotted Owl ^{4/}	NE	43,400	37,350	37,350	37,350	37,350	37,350	47,300	62,600	37,350
A9-Key Sites ^{4/ 5/}	NE	10,100	9,200	11,700	11,700	11,700	9,200	18,700	21,700	11,700
A10-Dev. Rec.	NE	650	650	650	650	650	650	650	650	650
A11-Winter Rec.	NE	6,450	6,450	6,450	6,450	6,450	6,450	6,250	5,950	6,450
A12-Outdoor Ed.	NE	450	450	450	450	450	450	450	450	450
Subtotal "A"	402,950	247,700	331,350	389,550	395,450	395,450	389,900	433,150	496,150	615,950
Category B										
B1-W/S Rivers	NE	0	0	18,200	18,200	18,200	5,550	15,450	16,750	15,950
B2-Viewsheds	NE	0	0	46,050	102,500	102,500	139,650	235,500	166,050	96,550
B3-Roaded Rec.	NE	0	0	0	750	750	0	0	0	0
B4-Pine/Oak	NE	0	0	15,600	14,850	14,850	0	6,750	5,300	5,200
B5-Woodpecker/ Pine Marten ^{5/}	NE	68,800	61,000	61,000	61,000	61,000	61,000	80,700	90,550	61,000
B6-Watershed	NE	0	0	23,000	34,900	34,900	0	57,150	56,500	31,950
B7-Gen. Rip. ^{4/}	NE	72,700	66,500	66,500	66,500	66,500	66,500	88,650	116,000	66,500
B8-Earthflows	NE	0	0	16,350	16,350	16,350	0	14,100	12,350	7,800
B9-Wildlife/Visual	NE	0	0	0	4,450	4,450	0	0	0	0
Subtotal "B"	317,700	141,500	127,500	246,700	319,500	319,500	272,700	498,300	463,500	284,950
Category C										
C1-Timber Emphasis	338,750	670,200	600,550	423,150	344,450	344,450	396,800	127,950	99,750	158,500
Total = Sum of Gross Acres in Categories A + B + C	1,059,400	1,059,400	1,059,400	1,059,400	1,059,400	1,059,400	1,059,400	1,059,400	1,059,400	1,059,400
Area Managed for Timber ^{6/}	656,450	608,300	561,200	521,200	513,900	513,400	508,800	488,300	425,900	278,600

^{1/} An additional 4,400 acres of non-Federal land occur in the Bull Run. In Alternative C, the Bull Run Municipal Watershed will be managed for timber production (Management Area C1), except for those areas needed to meet minimum management requirements.

^{2/} An additional 700 acres of non-Federal land occur within the boundaries of existing Wilderness.

^{3/} The acreage of three RNA's proposed in several alternatives is not reflected in this chart because the sites lie inside A1-Bull Run and A2-Wilderness Management Areas.

^{4/} This management area satisfies a minimum management requirement. MMRs may also be satisfied by other management areas, such as A2-Wilderness. In some alternatives, these A8, A9, B5 and B7 management areas include more than the acreage needed to satisfy minimum management requirements.

^{5/} Alternative NC, which is based on the current Timber Management Plan, allocates 4,600 acres to be managed for riparian objectives which are similar to those associated with Management Area A9.

^{6/} Includes land in Management Area Categories B and C, but does not include those portions of these management areas that have been identified as unsuitable for timber management.

Table II-9

Acres Suitable For Timber Production (by alternative)

	A L T E R N A T I V E									
	NC (No Change)	C	B (RPA)	D	E (Preferred)	G	A (No Action)	F	I	H
A. Tentatively suitable for timber production.	753,000	647,200	647,200	647,200	647,200	647,200	647,200	647,200	647,200	647,200
B. Unsuitable										
1. Category A	96,500	38,900	86,000	126,000	133,300	133,200	121,000	158,100	220,600	355,500
2. Not cost-efficient ^{1/}	0	0	0	0	100	600	17,400	800	700	13,100
Total Unsuitable	96,500	38,900	86,000	126,000	133,300	133,800	138,400	158,900	221,300	368,600
C. Suitable										
1. Category B	317,700 ^{3/}	92,400	84,600	152,000	203,900	203,400	123,800	374,100	339,000	148,500
2. Category C	338,800 ^{4/}	515,900	476,600	369,200	310,000	310,000	385,000	114,200	86,900	130,100
Total Suitable ^{2/}	656,500	608,300	561,200	521,200	513,900	513,400	508,800	488,300	425,900	278,600

1/ Given the economic assumptions upon which the FORPLAN model operated, these acres were not selected for harvest. These represent areas which are potentially available for harvest, given changes in assumptions about costs or prices.

2/ In order to facilitate the comparison of alternatives, they are often arrayed in tables and graphs in terms of the total of Category B and Category C acres which are eventually harvested as shown here.

3/ The existing Timber Management Plan refers to these as the "marginal" component (8,000 acres) and "special" component (339,000 acres).

4/ The existing Timber Management Plan refers to these as the "Standard" component.

These restrictions are a means to achieve the desired recreation experience for each zone.

Transition - This opportunity class is characterized by conditions of relatively concentrated use where encounters with other users are frequent. Opportunities for solitude are limited, and user controls shall be highly evident. Following are instances where this opportunity class applies: (1) short distances along arterial trail corridors, (2) areas where major trails intersect, converge, or lead to places of high interest, and (3) in the vicinity of staging areas or trailheads. The Transition opportunity class is considered a temporary condition that is at present inconsistent with the management objectives for Wilderness. The long-term management objective for Transition zones is the gradual elimination of the Transition opportunity class in favor of a more primitive "Wilderness" experience.

Semi-Primitive Trailed - This opportunity class is characterized by predominantly unmodified natural areas of moderate to large size. Concentration of users is usually low, but there is often evidence of other users in the area. User controls shall be present but must usually be subtle in nature. Facilities shall be provided for the protection of Wilderness resource values.

Only materials of natural appearance shall be used. Spacing of groups shall be formalized to disperse use

and provide low to moderate contacts with other groups or individuals.

Primitive Trailed - This opportunity class is characterized by an essentially unmodified environment. The concentration of users is low, and evidence of human use is minimal. These areas shall be managed essentially free from evidence of restrictions and controls. Only essential facilities for resource protection are allowed and shall be constructed of native or natural appearing materials. Facilities for comfort or convenience of the user shall not be allowed unless determined to be historically significant. Spacing of groups shall be informal and dispersed to minimize contacts with other groups or individuals.

Management Area A3 - Research Natural Areas

Goal: To preserve examples of natural ecosystems in an unmodified condition for research and education. To provide areas to serve as a baseline against which human impacts on natural systems can be measured. Generally, Research Natural Areas (RNAs) are set aside because they contain a distinctive or unique plant community and serve as gene pool reserves for plant and animal species, particularly those which are threatened or endangered or have been listed as "sensitive".

Direction: Lands now designated RNAs, or proposed for RNAs in an alternative, under 36 CFR 251.23, will

meet RNA objectives and criteria for classification (Dyrness, et al, 1975).

Programs: Management of Research Natural Areas assures that they provide:

- A baseline against which human influence on natural systems can be measured.
- Sites of education and research for ecological and environmental studies.
- Gene pool preserves for plant and animal species, in particular those which are threatened or endangered, and preserves of a distinctive or unique plant communities.

In general, public use, roads, timber harvest including salvage and cultural treatments, and outdoor recreation are not permitted in RNAs. These areas are recommended withdrawn from mineral entry, the mining and leasing laws and other inappropriate land uses.

Management Area A4 - Special Interest Areas

Goal: To protect and, where appropriate, foster public use and enjoyment of important historic, cultural, and natural aspects of our national heritage. To preserve and provide interpretations of unique geological, biological and cultural areas for education, scientific and public enjoyment purposes.

Direction: Special interest areas are managed to preserve their unique geological, biological, zoological, and cultural characteristics in the interests of providing interpretation, education, and research.

Programs: These areas are designated for developed and dispersed recreation, research, and educational opportunities. Facilities and opportunities may be provided for public interpretation and enjoyment. Uses are restricted to the extent necessary to protect the unique features and values of the areas. Scheduling of chargeable timber harvest is not permitted; however, salvage of timber is allowed to provide protection for the special features of the specific area and to provide for the safety of visitors. Proposed areas are recommended withdrawn from the mining laws and inappropriate land uses, including timber harvest.

Management Area A5-Unroaded Recreation - No Timber Harvest

Goal: To provide a spectrum of year around unroaded recreation opportunities and experiences in an undeveloped forest environment through the management of user activities and natural resource settings with which these activities are typically associated.

Direction: These areas are managed to minimize the presence of on-site contacts and use restrictions except where recreation facilities are provided to mitigate the impact from recreation use.

Program: The extent and intensity of management for dispersed recreation opportunities shall vary depending on the relative suitability of an area to provide a spectrum of recreation experiences. Recreation activities shall be nonmotorized in nature. No new roads shall be constructed in these areas, and existing roads must be closed. Specific activities shall be oriented toward recreation uses such as hiking, camping, fishing, hunting, horseback riding, mountain climbing, cross-country skiing, winter sports, and snowplay. There is no chargeable timber harvest in this Management Area. Salvage necessary to protect the forest may be allowed provided the management area standards can be met and no roads are constructed.

Management Area A6 - Roaded Recreation - No Timber Harvest

Goal: To provide a spectrum of year around recreation opportunities and experiences within a natural appearing environment where dispersed motorized recreation opportunities are available.

Direction: These areas are managed to provide for dispersed motorized recreation uses in settings that are natural appearing except where modifications of the landscape are made to accommodate recreation use. Recreation facilities are provided to accommodate use and minimize impacts to natural resources. New roads and trails may be constructed in these areas.

Programs: Specific activities shall be oriented toward recreational uses such as off-road vehicle use, motorcycle use, mountain bicycling, boating, snowmobiling, all terrain vehicle use, and auto camping.

Other dispersed recreation uses that are nonmotorized in nature may also occur within this Management Area, and shall be provided for and accommodated.

Scheduled chargeable timber harvest is not permitted in this Management Area. Salvage harvesting may be allowed to protect the forest, provided management area standards can be met.

Management Area A7 - Old Growth

Goal: To provide dedicated old growth forest areas in terms of quality, size and distribution. To insure perpetuation of old growth stands and trees through preservation of natural gene pools and to provide for aesthetic, scenic, recreational, and ecological aspects of old growth dependent species of plants and animals associated with overmature tree stands.

Direction: These areas are managed to preserve mature or overmature tree stands having large trees, snags, dead and down material and, in many situations, two or more canopy levels. Stands of old growth vary in size and location so that a wide variety of conditions will continue to be represented. Although evidence of human activity

may be visible, it is kept subordinate to old growth characteristics of the area.

Programs: Management programs are permitted provided they do not alter overall old growth stand conditions. These activities could include road access to the edge of the old growth stands, trails within the stands for walk-in dispersed recreation, habitat improvement projects for fish and wildlife, and educational or interpretive activities. Scheduling chargeable timber harvest is not permitted. Salvage timber operations or cultural treatments are not permitted within these areas.

Management Area A8 - Northern Spotted Owl Habitat Areas (SOHAs)

Goal: To provide and manage old growth forest habitat in terms of quality, size and distribution to maintain a viable population of spotted owls, which is an indicator species for old growth dependent wildlife species.

Direction: These areas are managed to provide sufficient size, quality, and distribution of old growth habitat to perpetuate populations of Northern Spotted Owls and other wildlife species represented by spotted owls. Nesting habitat and foraging areas are protected and enhanced. Stands of old growth must contain large trees, snags, dead and down material, and, in many situations, two or more canopy levels.

This Management Area will be composed of roughly 1000 acre units called spotted owl habitat areas (SOHAs). See appendix F, DEIS for a discussion of the effects of 2,200 acre SOHA's.

The initial locations of suitable habitat acreage within a given SOHA may change. This is because some of the acres with originally suitable timber stands may become unsuitable due to fires, diseases, or other changes, and some of the unsuitable stands may, through growth, become suitable. Such changes in timber stands would require exchanges; i.e., stands that become suitable owl habitat would be exchanged for others which become unsuitable. Exchanges would facilitate blocking up, or concentrating, old growth stands into contiguous habitat within the SOHAs.

Programs: Limited activities such as dispersed recreation are allowed provided conditions are not detrimental to managing for spotted owls. No new facilities or roads are constructed. Existing road systems are controlled, and road density is limited. Scheduling of chargeable timber harvest is not permitted. Salvage timber harvest or cultural treatments are not permitted within SOHAs.

Management Area A9 - Key Site Riparian Habitat

Goal: To maintain or improve riparian habitat conditions and hydrological conditions in a well-distributed network of selected riparian areas, notable for their exceptional diversity, high natural quality and key role in

providing for the continued production of riparian resources.

A secondary goal is to restrict levels of management for nonriparian dependent resources to those activities with high probability for benefits to riparian resources and that exhibit minimal risk of adverse effects.

Direction: Emphasis for management of these areas is the long-term maintenance or improvement of riparian ecosystem character and function, to maintain or improve terrestrial and aquatic habitat conditions associated with each individual area, and to favor natural ecosystem processes.

Programs: Riparian resource management emphasizes preferential consideration of riparian dependent resources through interdisciplinary planning and management. Other resource management activities are undertaken where they complement maintenance of riparian dependent resources. Soil, water, fish and wildlife management activities predominate. Dispersed walk-in recreation and interpretation are encouraged. Roading and developed recreation are discouraged. Scheduling of chargeable timber harvest is not permitted, but timber harvest may occur to the extent necessary to meet riparian management objectives. Salvage harvest may occur in order to meet riparian management objectives.

Management Area A10 - Developed Recreation Sites

Goal: To provide a range of quality outdoor recreation opportunities for concentrated recreation use at readily accessible, and appropriately designed, developed recreation sites.

Direction: Developed sites are managed at the level of operation and maintenance demanded by the public. It is expected that this will result in Full Service Management for developed sites, as defined below:

Operation and maintenance of developed recreation sites are at a level that insures normal life expectancy of facilities, and that meets established standards and management objectives for public service and use as per information contained in Forest Service Manual 2330 and the "Forest Service Green Book" (Cleaning Recreation Sites" U.S. Dept. of Agriculture, Forest Service Publication 8023 1801, ED&T 9009) ; i.e. Full Service standards of maintenance, service, and compliance. It insures the experience level for which the site is designed, meets standards and objectives for public health, safety, comfort and convenience, and meets other aspects of administration as outlined in Forest Service manuals and regulations. At this level, facilities are maintained in a fully functional condition, i.e. at RIM condition class 1 or 2, see Glossary, and all backlog rehabilitation needs associated with developed sites are completed.

Programs: These areas are managed for their value as recreation sites. At these sites physical improvements and often sophisticated facilities are maintained to offer a wide variety of developed recreation experiences. High concentrations of visitors occur where these developments are located. Visitors with little knowledge of outdoor activities and related skills are able to enjoy developed recreation facilities. Activities may involve use of motorized vehicles and are often water-related. Timber harvest and salvage operations in developed recreation sites shall be in accordance with vegetative management plans for each site. Scheduled chargeable timber harvest is not appropriate in developed sites. Developed sites are recommended withdrawn from timber harvest, mineral entry and other inappropriate land uses.

Management Area A11 - Winter Recreation Areas

Goal: To provide quality winter recreation opportunities including: downhill skiing, nordic skiing, snowmobiling, and snow play within a natural appearing forest environment.

Direction: Management of these areas includes providing winter recreation activities and developed winter facilities either as dispersed activities or under special use permit. Winter Recreation Management Areas include those currently under a special use permit or Master Plan, those areas with the potential to be managed for winter recreation use under such permit or plan, and those areas currently receiving heavy winter recreation use or those areas with potential to provide dispersed winter recreation opportunities, such as cross country skiing, snowplay and use of oversnow machines.

Programs: New facilities, roads, vegetation management, and other development activities within areas currently under permit or Master Plan are permitted if in compliance with approved Master Plans and special use permits. Developed recreation opportunities include downhill skiing facilities, nordic ski areas, and snowplay areas. Scheduled chargeable timber harvest is not permitted within portions of winter use areas under master plans or permits. Nonchargeable and salvage timber may be removed under terms of master plan or permit. Timber harvest activities and salvage operations within the portions of Winter Recreation Areas shall provide for retention of a natural appearing forest environment during the winter season. Developed portions of Winter Recreation areas shall be recommended for withdrawal from mineral entry and the mining laws to protect the facilities and winter recreation values of the area.

Management Area A12 - Outdoor Education

Objective: To Provide opportunities for outdoor public education programs, environmental interpretation, and other general recreation activities for groups.

Direction: Sites are to be generally preserved in their natural state. These areas are to provide outdoor education opportunities for public use and enjoyment.

Programs: Facilities, such as interpretative trails, picnic areas, shelters, and viewing areas, are permitted. Developments for outdoor education facilities follow existing site development plans. Timber harvest and salvage operations in Outdoor Education Areas shall be in accordance with vegetative management plans for each site. Scheduled chargeable timber harvest is not appropriate in Outdoor Education Areas.

(2) Category B

Management Area B1 - Wild, Scenic and Recreation Rivers

Overall Goal: To provide for the management of rivers, or segments of rivers, eligible for designation as Wild, Scenic, or Recreational Rivers and to avoid or mitigate any actions that might possibly affect potential for designation until Congress decides the disposition of the candidate rivers under the National Wild and Scenic Rivers Act of 1968.

Direction: The Clackamas, Roaring, Salmon, and White Rivers have been identified by the Forest as qualified for inclusion in the National Wild and Scenic Rivers System. Corridors along these four rivers have been analyzed and their eligibility established for classification as Wild and Scenic Rivers.

Wild River Segments: These segments are managed to perpetuate an unmodified natural environment and to retain these river segments essentially free of facilities. Access in general is by trail or water.

Scenic River Segments: These segments are managed to maintain or enhance the high quality of the scenery and essentially undeveloped character of their shorelines. Some structures or facilities may be visible from the river.

Recreation River Segments: These segments are managed to provide opportunities for a wide range of river oriented recreation activities. Public roads, recreation facilities, homes, and other development may be visible from these river segments or may be in close proximity to the river.

Programs: No new roads or chargeable timber harvest are permitted in wild river segments. New roads may be built in scenic river segments, but only for necessary access. Scheduled chargeable timber harvest in scenic segments may occur to maintain, restore, or enhance a natural appearing forest. New roads may be built in recreation river segments but must remain inconspicuous from the riverbanks. Scheduled chargeable timber harvest in the recreation segments shall be permitted to maintain forest cover. Salvage operations are permitted to protect the forest. No timber harvest operations are permitted in the foreground as viewed from the river.

Management Area B2 - Scenic Viewsheds

Goal: To provide Forest visitors with visually appealing scenery.

Direction: These areas are managed to maintain or enhance their appearance as seen from designated travel routes and areas of recreational use. Results of activities either shall not be evident or are visually subordinate to the natural landscape as seen by casual observers.

Programs: Limited timber harvest is planned within these viewsheds, but only to maintain or enhance the visual quality of the timber stands now and in the future, or to provide opportunities for opening views to unique landscape features. Such opportunities must be considered in management activities and projects within viewsheds. Shape, scale, and distribution of resource treatments are used to maintain the general natural landscape appearance. Negative visual elements such as spur roads, gravel pits, and utility corridors must be rehabilitated or screened. Chargeable timber harvest is scheduled at extended rotation ages of about 125 years in middleground partial retention, 200 years in foreground partial retention, and 250 years in foreground and middleground retention, in order to maintain a natural appearing or only slightly modified forest environment. Salvage harvest operations may occur, but must meet visual quality objectives.

Management Area B3 - Roaded Recreation-Reduced Timber Harvest

Goal: To provide a variety of dispersed recreation opportunities in settings where dispersed roaded recreation activity opportunities are provided and managed. Other management activities that are compatible with the standards may occur including dispersed nonmotorized recreation activities and management for other resource objectives, including timber harvest.

Direction: Areas are managed to provide dispersed motorized recreation uses in settings that are characterized by an environment where limited modifications of the natural landscape may occur. However, along sensitive travel routes and within recreation use areas, landscape modifications must appear subordinate to the surrounding area.

Programs: These areas are managed to provide for motorized use and timber harvesting. Recreation facilities shall be provided to accommodate use and minimize impacts to natural resources. Specific activities are oriented toward recreational uses such as off-road vehicle use, motorcycle use, mountain bicycling, boating, snowmobiling, all-terrain vehicle use, and auto camping.

Other dispersed recreation uses that are non-motorized in nature may also occur within this Management Area, and shall be accommodated. Chargeable timber harvest is scheduled at extended rotation ages of about 125 years in middleground partial retention, 200 years in foreground partial retention, and 250 years in foreground and middleground retention, in order to maintain a natural appearing or only slightly modified forest environment. Timber harvest operations must be designed to produce a "roaded natural" ROS setting for dispersed recreation. Salvage harvest operation may occur, but must leave a roaded natural ROS setting.

Management Area B4 - Pine/Oak Habitat

Goal: To maintain or enhance the Pine/Oak portion of the east side of the Forest, a major special wildlife habitat for dependent wildlife species; i.e., provide sufficient quantity and quality of Pine/Oak habitat to maintain viable resident populations of silver gray squirrel and wild turkey, and to provide sufficient transitory range to maintain the numbers of deer and elk recommended by the Oregon Department of Fish and Wildlife. To concurrently provide for wood products and other resource uses.

Direction: Manage vegetation to provide quantity and quality of habitat required by resident populations of silver gray squirrel and wild turkey. Transitory range for deer and elk will also be provided.

Programs: Scheduled chargeable timber harvest is designed to provide over time a minimum of five trees per acre of well-distributed mature or old growth Ponderosa Pine throughout the Pine/Oak habitat. The natural oak components of the stands are to be maintained through timber management.

Timber harvest thinnings are scheduled to achieve wildlife objectives. Salvage operations are permitted and designed to compliment wildlife objectives. Facilities, such as roads and trails, are designed or closed to minimize wildlife harassment and loss of effective habitat. Other resource management activities are allowed provided they are consistent with wildlife objectives.

Management Area B5 - Pileated Woodpecker/Pine Marten Habitat

Goal: To manage mature or old growth forest habitat of sufficient quality, quantity, and distribution to sustain reproductive pairs of pileated woodpeckers and pine martens in 600 acre unit-areas for pileated woodpeckers, and 320 acre unit-areas for pine martens.

Direction: These unit-areas are managed to provide habitat of sufficient size and distribution to sustain viable populations of the designated wildlife. Other animal species with the same habitat requirements are provided habitat as a result. Nesting and feeding habitat are mature or overmature stands containing well-distributed snags. Habitat areas are well-distributed throughout the Forest.

Programs: Scheduled chargeable timber management activities occur over extended harvest periods. Salvage operations are not permitted within the unit-areas since minimum mature/old growth forest acreage, including snags and large down logs, must be maintained continuously. Other management programs such as recreation, fisheries, and range may be allowed, provided activities are consistent with wildlife objectives in these areas.

Management Area B6 - Special Emphasis Watersheds

Goal: To maintain or improve watershed conditions within selected watersheds having special management needs in order to maintain or improve water quality for municipal uses and fish production. To maintain or improve the diversity of riparian and aquatic habitats for the sustained, long-term production of fisheries.

Direction: Each entire area is managed with sensitivity for the special needs of Forest watersheds. General watershed condition and diversity of terrestrial and aquatic habitats are maintained or improved. Long-term watershed stability receives special emphasis throughout each area.

Programs: Most multiple-use management activities, including scheduled chargeable timber harvest and salvage operations, may take place in these areas. However, these activities must reflect special consideration for watershed needs through their timing, intensity, extent, or duration. Such considerations are especially important next to streams, lakes, reservoirs, wetlands, seeps, and springs within the watersheds. These considerations also apply to a lesser degree to all upland areas within the watersheds. Where municipal water supplies are obtained from special emphasis watersheds, additional considerations may be applied to reflect needs to restrict public access and recreation use.

Management Area B7 - General Riparian Areas

Goal: To maintain or improve habitat conditions for the sustained, long-term production of fish, selected wildlife and plant species, and high quality water for the full spectrum of the Forest's riparian areas.

Direction: These areas are managed to maintain or improve the general diversity of their terrestrial and aquatic habitats. Areas include those associated with streams, lakes, reservoirs, wetlands, seeps, and springs. Management emphasizes a relatively high diversity of vegetation species, multiple canopy layers, frequent small openings, and standing and down woody material.

Programs: Multiple-use management activities including scheduled chargeable timber harvest and salvage operations may take place in these areas. However, these operations must be modified to provide for maintenance of the riparian zone through their location, timing, intensity, extent, or duration. The mixture of tree species must be maintained or increased with the riparian zones. Walk-in recreation and other dispersed activities are generally compatible with riparian area management.

Management Area B8 - Earthflows

Goal: To provide management and utilization of forest resources on large, slow-moving earthflows.

Direction: Special management practices are invoked to reduce the risk of reactivating or accelerating large, slow-moving earthflow landslide areas. Management emphasis is directed to the maintenance of the important hydrologic and physical balance required to keep slow-moving landforms from moving farther down a slope.

Programs: All management programs are analyzed and designed to meet the objectives of avoiding the reactivation or acceleration of earthflow area movement.

Scheduled chargeable timber harvest is programmed on earthflow areas; however, at least 80 percent of each earthflow must be maintained in timber cover at least 30 years of age. Openings created by timber harvest, wildlife improvement projects, and other management activities are limited in size where they would impact these areas. Salvage and thinning operations are permitted provided standards for the management area are met.

Management Area B9 - Wildlife/Visual

Goal: To provide quality habitat for big game and riparian-associated species while maintaining visual quality and providing wood products.

Direction: Management of these areas emphasizes quality forage and thermal cover for deer and elk. Vegetation management includes maintaining minimum amounts of these areas in very young timber stands to provide forage at all times. These areas include older timber stands of the proper size and distribution to provide hiding and thermal cover. Hunting access restrictions are applied to animal harvest during the times when wildlife are using the area.

Programs: Scheduled chargeable timber harvest and salvage operations are permitted in this management area, but are constrained by wildlife and visual standards and are allowed only between July 1 and November 1 each year. New roads are allowed but may be closed after management activities. Appropriate visual quality standards are met where landscapes are visible from popular travel routes. Other resource activities are allowed consistent with wildlife/visual objectives.

(3) Category C

Management Area C1 - Timber Emphasis

Goal: Chargeable timber harvest is scheduled in these areas as a dominant objective, while other resource objectives and outputs would be jointly produced. Management activities in Category C areas are designed primarily to provide wood products needed to meet national demand, and to support local communities dependent on timber for employment, while achieving the objective of promoting a healthy, growing Forest mosaic through timber harvest. These objectives are achieved while concurrently being sensitive to, and managing for, the other forest resource uses and values including transitory forage production and public recreation use.

Timber harvest levels are based on suitability and capability of the land in accordance with applicable laws and regulations.

Direction: All suitable lands within this management area are available for producing commercial quantities of timber. Timber is managed to provide a mixture of stands in a variety of age classes. Timber stands are to be managed to promote vigorous, healthy trees while utilizing the productive potential of the designated sites. Management shall employ a specific set of practices under standards for this Management Area that include a full range of silvicultural systems and harvest methods and stand treatments including controlling stocking levels, maintaining satisfactory growth rates, protecting stands from insects and disease, controlling species composition, and employing several methods of regenerating stands. Stands shall be managed for retention of minimum required amounts of standing dead (snags) and dead and down woody debris.

Inventory: Management direction has been based on the locations and volumes of standing timber provided by the 1962 inventory and subsequent updates. A new inventory is scheduled for completion in 1988. As new data is provided by this inventory, it will be used to monitor, evaluate and/or modify timber yields and outputs under the Proposed Land and Resource Management Plan.

Programs: Extensive road systems must be developed and maintained to facilitate timber management, while providing for efficient transportation of Forest products and safety of Forest visitors and users. Consideration within this Management Area should be given to making forage available for livestock and wildlife. Recreation activities in Timber Emphasis Areas should focus on the use of existing or new transportation systems, including recreation and administrative trails, and other dispersed recreation activities. They include hunting, fishing, berry-picking, off-road vehicle use, gathering of various Forest products and firewood cutting. Also included are winter sports, such as cross country skiing, snowmobiling and snow-play.

D. Outputs, Effects, Economics, And Tradeoffs

The primary input to each alternative, acres allocated to specific management areas, has just been presented and discussed in Section C of this chapter. Selected outputs and effects resulting from managing these areas will now be discussed relative to the Public Issues. An index to this discussion is as follows:

Public Issue	Section
1: Timber	D.1.
2: Fish Habitat / Water Quality	D.2.
3: Wildlife	D.3.
4: Recreation	D.4.
5: Unroaded	D.5.
6: Communities	D.6.

Sometimes the same output will appear with respect to two Public Issues. This indicates the interrelationship of resource management programs. The minerals program is discussed at the end of the discussion on Communities.

During the evaluation of alternatives, numerous outputs and effects of alternatives were estimated and considered. From these, the most important and reliable estimates of alternative performance were selected for comparing alternatives in this chapter of the DEIS.

Most outputs and effects are affected by the number of acres in the land base suitable for timber production. For this reason, alternatives are arrayed left-to-right in Sections D.1. through D.6, according to the number of acres suitable for timber management. These are the total acres in Management Area Categories B and C shown in Table II-9. Alternative NC, which has the largest land base, thus appears to the left of the other alternatives in these tables.

Section E.7 will present economic aspects of the alternatives. Section E.8 will conclude this chapter by summarizing tradeoffs in terms of the indicators of responsiveness of alternatives to major issues and national concerns.

1. Public Issue 1: Timber

a. Outputs

Figures II-1 and II-2 illustrate the relationship of two of the timber outputs to the various alternatives.

Figure II-1

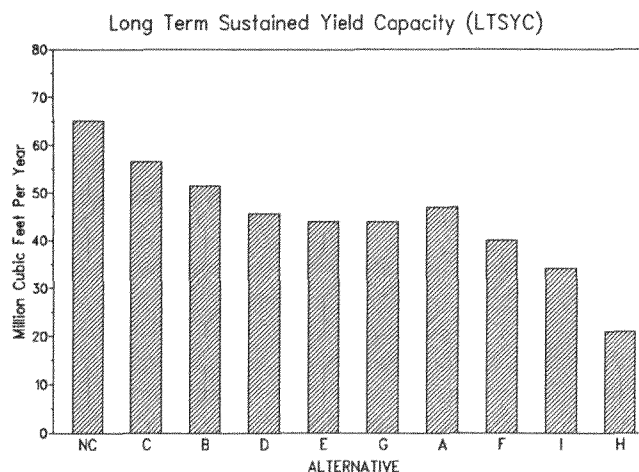


Figure II-2

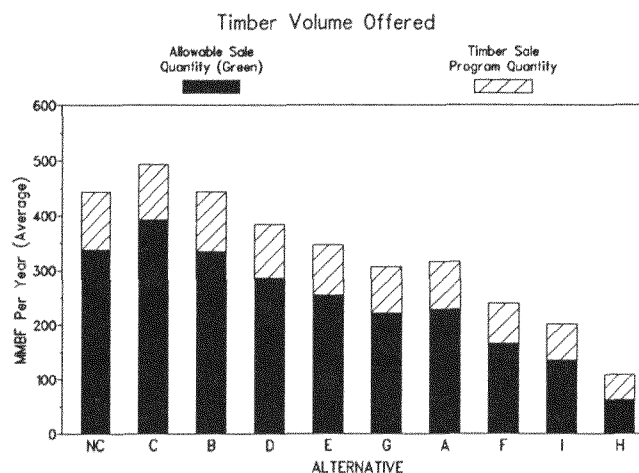


Table II-10

Outputs Related To The Timber Supply Question.

OUTPUT	UNIT OF MEASURE	A L T E R N A T I V E									
		NC No Change	C	B (RPA)	D	E Preferred	G	A No Action	F	I	H
Allowable Sale Quantity (ASQ), Green	Million Board Feet (MMBF)										
1st Decade, Ave. Annual		339	393	335	287	255	222	229	166	136	62
2nd Decade, Ave. Annual		N.E.	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.
5th Decade, Ave. Annual		N.E.	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.
Other Timber Volume	MMBF										
1st Decade, Ave. Annual		104	100	109	98	92	85	87	73	66	46
2nd Decade, Ave. Annual		N.E.	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.
5th Decade, Ave. Annual		N.E.	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.
Timber Sale Program Quantity (TSPQ)	MMBF										
1st Decade, Ave. Annual		443	493	444	385	347	307	316	239	202	108
2nd Decade, Ave. Annual		443	460	413	353	323	307	316	239	202	108
5th Decade, Ave. Annual		443	387	387	329	324	307	316	275	238	151
Allowable Sale Quantity (ASQ), Green	Million Cubic Feet (MMCF)										
1st Decade, Ave. Annual		65.1	77.5	66.1	56.5	50.3	43.8	45.2	32.8	26.8	12.2
2nd Decade, Ave. Annual		65.1	75.6	60.0	50.3	45.5	43.8	45.2	32.8	26.8	12.2
5th Decade, Ave. Annual		65.1	56.6	54.8	45.6	43.8	43.8	45.2	39.9	34.0	20.6
Other Timber Volume	MMCF										
1st Decade, Ave. Annual		23.1	19.7	21.5	19.3	18.2	16.8	17.2	14.4	13.0	9.1
2nd Decade, Ave. Annual		N.E.	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.
5th Decade, Ave. Annual		N.E.	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.
Timber Sale Program Quantity (TSPQ)	MMCF										
1st Decade, Ave. Annual		88.1	97.2	87.6	75.9	68.5	60.6	62.4	47.2	39.8	21.3
2nd Decade, Ave. Annual		N.E.	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.
5th Decade, Ave. Annual		N.E.	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.
Long Term Sustained Yield Capacity (LTSYC)	MMCF/YR	65.1	56.6	51.4	45.6	43.8	43.8	46.9	39.9	34.0	20.9
Timber Growth in the Year 2030	MMCF per Year	66.1	56.3	49.9	43.2	39.7	37.3	47.3	35.4	32.0	23.7
Eventual Harvest Method:											
Clearcut	Acres	492,000	455,200	422,800	390,000	373,400	372,900	376,900	298,400	260,600	176,800
Shelterwood/Seed Tree	Acres	150,900	134,200	121,100	110,800	119,200	119,200	120,200	164,400	136,600	87,600
Selective	Acres	13,100	18,900	17,300	20,300	21,300	21,300	11,700	25,500	28,700	14,200
Total	Acres	656,000	608,300	561,200	521,200	513,900	513,400	508,800	488,300	425,900	278,600
Fuelwood	Thousand Cubic Feet										
1st Decade, Ave. Annual		4557	5149	4293	3671	3268	2846	2932	2132	1741	796
2nd Decade, Ave. Annual		4100	4588	3900	3269	2958	2846	2932	2132	1741	796
5th Decade, Ave. Annual		3690	3173	3248	2693	2764	2745	2410	2458	2072	790
Reforestation	M Acres										
1st Decade, Ave. Annual		7.09	7.61	5.57	4.40	4.38	3.78	4.52	3.52	2.76	2.90
2nd Decade, Ave. Annual		6.52	6.63	5.57	4.45	3.36	2.28	4.46	1.58	0.43	0.63
5th Decade, Ave. Annual		5.29	4.37	4.12	2.86	2.50	1.23	3.11	0.46	0.48	0.08
Timber Stand Improvement	M Acres										
1st Decade, Ave. Annual		3.61	5.90	5.59	5.43	5.40	5.34	5.02	5.12	4.80	4.27
2nd Decade, Ave. Annual		N.E.	7.94	5.28	4.50	4.98	4.63	4.21	3.46	3.27	2.91
5th Decade, Ave. Annual		N.E.	15.37	12.30	11.15	9.95	9.37	5.34	6.25	5.25	1.74

Table II-11

Other Outputs Associated With Timber Supply

OUTPUT	UNIT OF MEASURE	A	L	T	E	R	N	A	T	I	V	E
		NC	C	B	D	E	G	A	T	F	I	H
		No Change		(RPA)			Preferred	No Action				
ARTERIAL AND COLLECTOR ROAD CONSTRUCTION/RECONSTRUCTION	Miles											
1st Decade, Ave. Annual		9	17	15	13	11	9	8	5	4	2	
2nd Decade, Ave. Annual		8	14	13	9	8	8	8	6	5	2	
5th Decade, Ave. Annual		9	10	9	6	6	6	7	5	4	2	
TIMBER PURCHASER ROAD CONSTRUCTION/RECONSTRUCTION	Miles											
1st Decade, Ave. Annual		27	43	37	36	32	25	26	18	15	7	
2nd Decade, Ave. Annual		26	39	37	28	25	24	25	18	15	7	
5th Decade, Ave. Annual		58	48	42	34	30	25	40	23	21	16	
ROADS SUITABLE FOR PUBLIC USE ^{1/}												
Passenger Car	Miles											
1st Decade		1355	1386	1376	1370	1363	1353	1353	1341	1336	1326	
2nd Decade		1427	1515	1491	1461	1444	1420	1422	1391	1375	1343	
5th Decade		1732	1859	1822	1681	1654	1616	1700	1552	1506	1431	
High Clearance Vehicle	Miles											
1st Decade		1797	1857	1835	1825	1812	1791	1792	1769	1759	1735	
2nd Decade		1962	2131	2078	2023	1989	1942	1949	1882	1850	1778	
5th Decade		2675	2907	2818	2516	2460	2383	2565	2246	2154	1995	
FUEL TREATMENT	Acres											
1st Decade, Ave. Annual		9630	12380	11190	10800	10040	8330	8870	7380	6970	5250	
2nd Decade, Ave. Annual		7120	9520	7380	6520	6010	5150	6680	3770	5240	1800	
5th Decade, Ave. Annual		11810	10790	10520	8190	7350	5750	9870	5310	5370	3540	
AIR QUALITY	PPM of Suspende Particle											
1st Decade, Ave. Annual		5896	7605	6934	6733	6266	5198	5466	4591	4180	3263	
2nd Decade, Ave. Annual		4017	5366	4373	3852	3547	3045	3724	2341	2710	1102	
5th Decade, Ave. Annual		4446	5045	5178	3913	2770	3624	4122	3008	2714	1725	
FIRE MANAGEMENT EFFECTIVENESS INDEX	\$ Cost Per 1000 Acres											
1st Decade, Ave. Annual		3922	4932	4517	4109	3846	3929	3604	3099	2843	2186	
2nd Decade, Ave. Annual		3922	4586	4261	3846	3791	3929	3604	3099	2843	2193	
5th Decade, Ave. Annual		3922	3853	4047	3846	3805	3929	3604	3397	2843	2539	
RANGE (LIVESTOCK GRAZING)	AUM's											
1st Decade, Ave. Annual		12600	14500	12600	11100	10200	9200	9400	7600	6700	4600	
2nd Decade, Ave. Annual		12600	13300	12400	10200	9500	9200	9400	7600	6700	4600	
5th Decade, Ave. Annual		12600	11100	10400	9500	9600	9200	9400	7600	6800	5800	

1/ Does not include 264 miles of roads under state, county, or private jurisdiction.

b. Comparisons of Past and Projected Timber Outputs

Tables II-10 and II-11 present some of the more significant outputs related to timber production.

Table II-12 displays timber outputs planned under the various alternatives discussed in this document. Alternative NC represents timber volumes planned under the existing Timber Management (TM) Plan as of 1984. Also displayed are volumes actually sold under the existing Timber Management Plan during the period from 1977 through 1986. Section C.4.b in this chapter ex-

plained that the data used to formulate Alternatives A through I were different from that used for Alternative NC. This difference is primarily responsible for the difference in the ASQs of Alternatives NC and A.

c. Timber Resource Management Information.

Table II-13 addresses the interrelationship between the alternatives' respective ASQs, acres suitable for timber harvesting, inventory of timber on the suitable acres, and LTSYC's. Following the table is a column-by-column description of the data presented in the table. Note that because Alternative NC was not developed using the

Table II-12

Comparison - Past, Present And Alternative Timber Outputs
(Expressed in Average Annual MMBF)

	TIMBER SOLD ^{1/} HISTORICALLY	A L T E R N A T I V E ^{2/} (Average MMBF/Yr During the First Decade)									
		NC	C	B	D	E	G	A	F	I	H
I. ALLOWABLE SALE QUANTITY (ASQ) - The allowable sale quantity is composed of those volumes resulting from the yield projections of FORPLAN. ASQ is obtained from lands designated as suitable for timber production under NFMA standards, and meets the utilization standards in the Regional Guide. When sold, the volume is called "chargeable", and is used to determine achievement of planned ASQ goals.											
A. ASQ, Green	320	339	393	335	287	255	222	229	166	136	62
B. ASQ, Salvage	17	17	18	14	13	13	13	14	12	11	7
TOTAL ALLOWABLE SALE QUANTITY	337	356	411	349	300	268	235	243	178	147	69
II. OTHER SAWTIMBER - Meets utilization standards in Regional Guide, but is not considered "Chargeable" against the planned ASQ goals.											
A. Sawtimber from lands designated unsuitable for timber production - this volume is estimated based on the incidental volume of timber that will be sold from lands that are not designated for timber production.											
1. Other Sawtimber, Green	9	21	0	21	21	21	21	21	21	21	21
2. Other Sawtimber, Salvage	4	4	4	3	3	3	3	3	3	3	2
3. Total From Unsuitable Lands	13	25	4	24	24	24	24	24	24	24	23
B. Dead Sawtimber from lands that are designated suitable for production, but not included in yield tables.	4	5	5	4	4	3	3	3	2	2	1
TOTAL OTHER SAWTIMBER	17	30	9	28	28	27	27	27	26	26	24
III. SUBMERCHANTABLE VOLUME - The estimated timber volume that does not meet the utilization standards in the Regional Guide, but which could be utilized products other than sawtimber. It is not considered "chargeable" against planned ASQ goals.											
A. Submerchantable, fuelwood	5	22	26	22	19	17	14	16	11	9	11
B. Submerchantable, other (including cull)	25	35	47	45	38	35	31	30	24	20	4
TOTAL SUBMERCHANTABLE	30	57	73	67	57	52	45	46	35	29	15
TOTAL NET MERCHANTABLE (Category I + II)	354	386	420	377	328	295	262	270	204	173	93
TOTAL NONCHARGEABLE (Category II + III)	47	87	82	95	85	79	72	73	61	55	39
IV. TIMBER SALE PROGRAM QUANTITY (I+II +III) - Includes the ASQ and estimated additional volume (such as firewood) planned for sale during the first decade.	384 ^{3/}	443	493	444	385	347	307	316	239	202	108

1/ Average of timber volumes sold from 1977 through 1986.

2/ The Final Environmental Impact Statement for the Timber Management Plan of the Mt. Hood National Forest, Oct 26, 1977, and the Timber Management Plan, Mt. Hood National Forest, approved Feb 22, 1978, Region Six.

3/ Regional records show 397 MMBF. The difference results from methods for accounting for volume which is submerchantable or reoffered.

Table II-13
Timber Resource Management Information

BENCHMARK OR ALTERNATIVE	SUITABLE ^{1/} LANDS INVENTORY				FIRST DECADE AVERAGE ANNUAL ASQ GREEN			LONG TERM SUSTAINED YIELD CAPACITY (LTSYC)			AVERAGE ANNUAL NET GROWTH		
	H Acres	Begin	Begin	End	MMCF	x ^{2/}	MMBF	MMCF	x ^{3/}	Decade Met	Cubic Feet Per Acre		MMCF
		MMCF	CF/AC	MMCF							Present	Year 2030	
Column	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
BENCHMARKS													
Maximum Timber	608.3	3578	5882	2645	59.9	1.7%	304	59.9	2.2%	1st	51.6	94.7	57.6
Maximum PNV	608.3	3578	5882	2414	56.6	1.6%	287	56.6	2.3%	1st	51.6	75.5	45.9
ALTERNATIVES													
NC (No Change)	656.5	3860	5880	2856	65.1	1.7%	339	65.1	1.7%	1st	54.8	100.7	66.1
C	608.3	3578	5882	2422	77.5	2.2%	393	56.6	2.3%	1st	51.6	92.6	56.3
B	561.2	3170	5649	2195	66.1	2.0%	335	51.4	2.3%	1st	51.6	88.9	49.9
D	521.2	2898	5561	2143	56.5	1.9%	287	45.6	2.1%	1st	51.6	83.0	43.2
E (Preferred)	513.9	2841	5534	2197	50.3	1.8%	255	43.8	2.0%	1st	51.6	77.4	39.7
G	513.4	2838	5529	2163	43.8	1.5%	222	43.8	2.0%	1st	51.6	72.7	37.3
A (No Action)	508.8	2867	5636	2405	45.2	1.6%	229	46.9	2.0%	1st	51.6	92.9	47.3
F	488.3	2705	5540	2278	32.8	1.2%	166	39.9	1.7%	5th	51.6	72.4	35.4
I	425.9	2274	5328	2073	26.8	1.2%	136	34.0	1.6%	5th	51.6	75.0	32.0
H	278.6	906	3111	1160	12.2	1.3%	62	20.9	1.8%	6th	51.6	81.4	23.7

BENCHMARK OR ALTERNATIVE	AREA & PERCENT OF SUITABLE LAND BY YIELD LEVEL						HARVESTS DURING THE FIRST DECADE			
	FULL YIELD		75-90% YIELD		UNDER 75% YIELD		CLEARCUT	SHELTERWOOD/ SEED TREE	SELECTION	TOTAL AS FOREST %
	Thousands of Acres	x ^{2/}	Thousands of Acres	x ^{2/}	Thousands of Acres	x ^{2/}	Thousands of Acres	Thousands of Acres	Thousands of Acres	x ^{2/}
Column	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)
BENCHMARKS										
Max Timber	515.9	85%	0	0	92.4	15%	51.8	7.8	1.9	10%
Max PHV	515.9	85%	0	0	92.4	15%	43.7	9.0	1.7	8%
ALTERNATIVES										
NC(No Change)	338.8	52%	0	0	317.7	48%	83.0	25.5	0.2	14%
C	515.9	85%	0	0	92.4	15%	60.9	17.9	2.5	13%
B (RPA)	476.6	85%	0	0	84.6	15%	51.0	14.6	2.1	10%
D	411.4	79%	0	0	109.7	21%	48.8	13.8	2.5	10%
E(Preferred)	390.8	76%	0	0	123.1	24%	41.9	13.4	2.4	9%
G	390.8	76%	0	0	122.6	24%	32.8	10.7	1.9	7%
A(No Action)	445.1	87%	0	0	63.7	13%	39.4	12.0	1.2	8%
F	334.0	68%	0	0	154.3	32%	20.1	11.0	1.7	5%
I	269.4	63%	0	0	156.5	37%	16.5	8.7	1.8	4%
H	206.0	74%	0	0	72.6	26%	8.6	4.0	0.7	2%

1/Tentatively suitable lands for all alternatives except NC: 647,200 acres, and present inventory of 3866 MMCF.

2/Column (5) divided by column (2).

3/Column (8) divided by column (4).

4/Column (14) divided by column (1), Part A.

5/Column (16) divided by column (1), Part A.

6/Column (18) divided by column (1), Part A.

7/Sum of columns 20 through 22, divided by tentatively suitable acres. Tentative land base for Alternative NC is 753,000 acres. The tentative land base for all other alternatives is 647,200 acres.

Note: The acres shown as the suitable land base for full timber yield in column (14) can be compared to the 751,000 acres of Standard, Special and Marginal lands used in the Timber Management Plan as the commercial Timber Land Base. However, the inventory criteria used to develop the land base for the Timber Management Plan differed from the criteria used to develop the tentatively suitable land base for developing alternatives for the Forest Land and Resource Management Plan (Forest Plan). Refer to discussion of suitability in Chapter III of this DEIS for further details.

FORPLAN model, the estimates provided for this alternative are not always comparable to those for other alternatives.

Suitable acres (column 1)

For the benchmarks and alternatives other than NC, the amount of land managed for sustained timber yield is initially a function of acres determined to be tentatively suitable, 647,200 acres, under the process described in Chapter III. As discussed in conjunction with the description of Alternative NC, a different process was used to determine the tentatively suitable land base on which the existing Timber Management Plan is predicated: 753,000 acres. This resulted in a 106,000 acre difference between the tentatively suitable land base for Alternative NC (No Change) and that used for the other alternatives.

The suitable land bases for the benchmarks and Alternative C are smaller than the tentative base of 647,200 acres solely because of allowances for minimum management requirements. In Alternative B, the suitable land base is further reduced in order to preclude chargeable harvesting in the Bull Run Watershed. Alternatives A, D, E, F and G differ primarily in the amount of unroaded area, such as special interest and unroaded recreation management areas, from which timber management is excluded. Alternatives H and I have no timber management in any unroaded areas, nor any in some roaded areas with high watershed, wildlife, or recreation values. Alternative H, in addition, protects all existing old growth outside of unroaded areas.

Inventory (columns 2-4)

These columns show that the volume of inventory in million cubic feet, available for harvest in the first decade of every alternative (Column 2) is a direct function of the suitable land base (Column 1). The inventory per acre (column 3) demonstrates that there is little difference in the volume presently standing on timber-growing lands among the alternatives. There are exceptions. Unlike other alternatives, the benchmarks and Alternative C include the Bull Run Watershed in the suitable land base. Its high proportion of old growth timber increases the Forest average volume per acre over that of other alternatives. Alternative H excludes land supporting timber greater than 200 years old from the suitable timber base. Consequently, its inventory per acre and total inventory are much lower than that of any other alternative.

The ending inventory, column 4, represents the amount of timber volume needed to support the Long-Term Sustained Yield Capacity (LTSYC) indefinitely. It is a function of natural site productivity plus timber management intensity and the rotation length. Timber management intensity determines the growth rate (columns 11-13)

and the volume at any point in time. Rotation length determines how often each stand may be harvested.

Alternative NC and the Maximum Timber Benchmark have the highest ending inventory because they have the greatest amount of land managed under the highest timber intensities. Alternative F has a relatively high inventory because much of the timber base will be managed on extended rotations to achieve visual quality objectives. Alternative D has fewer of its suitable lands managed on extended rotations than Alternative F. It also has fewer acres managed under the maximum timber intensity than the Maximum Timber Benchmark, and has less productive acres as well. Its final inventory is relatively low. Final inventories in other alternatives are a result of similar interactions.

In every case, except Alternative H, inventory declines over time as old natural stands are replaced by young managed stands. Alternative H increases its inventory because its land base is dominated in the first decade by stands of young, small timber.

ASQ and LTSYC (columns 5-10)

While management intensity and rotation length contribute to LTSYC, alternatives vary directly with the size of the land base designated as suitable for timber production. First decade ASQ, green, also depends on the age distribution of timber stands and on presence or absence of nondeclining flow constraints. Using first decade harvest volumes produces essentially the same ranking of alternatives as LTSYC. This is by design. Alternatives with a strong emphasis on timber have both a large land base and a departure. Alternative NC is inconsistent with this pattern because the current timber plan does not call for a departure.

The benchmarks are constrained by nondeclining flow. They demonstrate that, even when all of the tentatively suitable land is devoted to timber management except where needed to meet MMRs, the potential timber yield from land included in the existing Timber Management Plan of 384 MMBF/yr. cannot be sustained. Alternative C demonstrates that, by relaxing the nondeclining flow constraint, this volume can be exceeded for 10 years: if lower volumes of timber are produced thereafter.

Alternative B exceeds the nondeclining benchmarks' volumes by departing for fifty years, which compensates in the short run for the Bull Run Municipal Watershed being unsuitable in this alternative. Alternative D achieves the first decade timber harvest level of the Maximum PNV Benchmark by maximizing volume for ten years and allowing a departure, although it uses fewer acres. Alternatives E and G manage the same lands for timber and have the same LTSYC. However, Alternative E is not constrained to nondeclining harvest flow;

i.e., it is a departure, and therefore, has a higher first decade ASQ.

Ability to harvest timber in the first decade is limited by the Long-Term Sustained Yield Capacity in Alternatives A and G. Alternatives F, H and I cannot achieve their LTSYC's in the first decade. This is because considerations for visual quality, wildlife, and watershed resources slow the rate of harvest of existing timber stands in these alternatives. Spatial constraints, to achieve distribution of timber sales, in these alternatives reduce the availability for harvest of significant amounts of merchantable volume for the first few decades. ASQ, TSPQ, and LTSYC for the alternatives are displayed in Figures II-1, 2, and 3.

Growth (columns 11-13)

Initial growth per acre depends primarily on site productivity and age of stands in the suitable land base. Average site productivity does not vary among alternatives, because the type of lands managed for timber does not vary much by alternative. Data on past growth is not precise enough to reliably estimate these small differences.

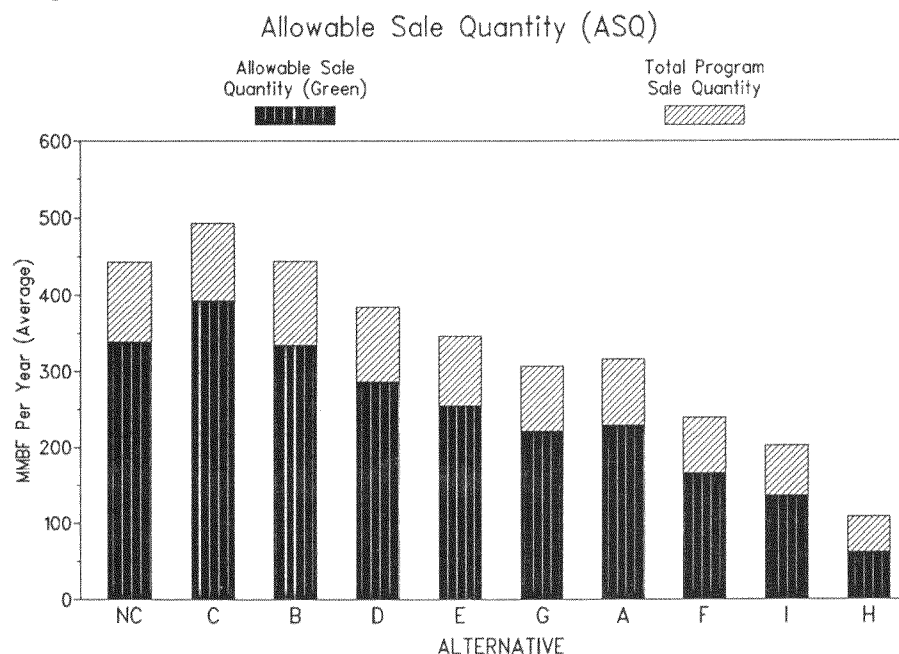
Growth rates increase over time in all alternatives. This is generally because old, slow-growing stands are being converted to young stands which quickly increase in volume. Growth rate in 2030 depends upon two main

factors: how much of the existing mature timber remains, and how intensively the new timber stands are managed. These and other factors are described in more detail in Appendix B.

The greatest growth rates in 2030 are found in the Maximum Timber Benchmark and Alternatives NC, A, B and C. The estimate for Alternative NC is based on the Timber Management Plan and is not comparable to the other alternatives. The Benchmark and the other three alternatives share a dominant objective. In all of them, the objective was to maximize timber: for 150 years in the Benchmark and Alternative A, for 50 years in Alternative B, and for 30 years in Alternative C. In addition, Alternative A was limited to currently used management prescriptions, which are essentially all high intensity. The proportion of high intensity prescriptions is high in the benchmark and all of these alternatives because of the need to meet timber objectives. In addition, the departure Alternatives, B and C, exhaust the harvestable surplus of timber, and investments are needed to maintain timber volume at the long-term sustained yield capacity in the later decades.

The lowest growth rates in 2030 are found in the Maximum PNV Benchmark and Alternatives F, G and I. These alternatives and the Benchmark all maximize PNV, subject to a nondeclining flow constraint. Surplus

Figure II-3



harvestable existing inventory is still available in the later decades. Use of this surplus is a more economical means of meeting the nondeclining flow constraint in later decades than increasing volume from managed stands by selecting high intensity prescriptions in the early decades. Increased timber growth is therefore not achieved as quickly. Growth continues to increase in later decades.

When total growth is compared (column 13), the total area managed for timber is the predominant effect revealed. However, the per-acre growth of timber in Alternatives A, B and C is sufficiently high to produce a higher total volume than the maximum PNV benchmark, which includes more suitable acres than Alternatives A and B and the same number of suitable acres as C.

Yield levels (columns 14-19)

Reductions in area available for timber management are not the only reasons for differences among the alternatives' timber yields. Combining emphasis on timber production with emphasis on other resources on the same acre, as is done in Category B Management Areas, often results in less than optimal management for both resources, but greater total benefits. The amounts of land with shared resource objectives that affect long-term timber yield are shown as the reduced yield column. The sum of the acres in these three columns is the total in Column 1. In the benchmarks and Alternatives B and C, MMRs reduce yields to provide for mature or old growth forest, for wildlife species, and water quality and fish production. The major additional acres in reduced yield categories in Alternative D are in the sensitive earthflows and scenic viewsheds. Management for resources other than timber, particularly for visual quality, increases in Alternatives A, E, G and especially F. Additional wildlife and water resources management reduces timber yields on some suitable lands in Alternatives H and I.

Harvest systems (columns 20-23)

Acres shown in each category are highly correlated to the total area harvested in the first decade in each alternative. Harvested acreage is greatest in Alternative NC, which has the largest land base for timber, followed by the departure Alternatives, B, C, D, and E, which remove more volume in the first decade than in any other decade. The Maximum Timber Benchmark harvests a large amount of low volume sites in the first decade.

Harvested area as a percentage of the suitable land base, Column 23, may be used as an indicator of the implementability of the alternatives. For a given suitable land base, the greater the percentage, the lower the probability that the optimum ASQ, Green, indicated by FORPLAN can be achieved. It will also be more dif-

ficult to locate sales in the field while meeting the harvest dispersion requirement and other management resource objectives. In this regard, the feasibility of implementing a departure alternative is less than the feasibility of implementing a nondeclining flow alternative. For example, Alternative E has the same land base as Alternative G, but with its departure timber schedule, more areas must be found in which to harvest timber in the first decade.

Projected uses of different harvest systems are based on timber working group and management emphasis. Proportions of different working groups suitable for timber management do not vary much among alternatives. Differences in management emphasis produce differences in harvest systems similar to the differences evident in the yield level categories. Alternatives F and I have the lowest proportions of clearcuts, as well as the most acres where timber yield is reduced.

The remaining alternatives do not follow either pattern just described. Alternative H has a greater growth in 2030 than other alternatives with a nondeclining timber harvest schedule. This is because its timber-growing base is initially composed of younger stands. Alternatives D and E have lower growth than other alternatives that maximize timber. The emphasis on timber in these two alternatives is not as strong as in the first group discussed. Both allow departures from nondeclining flow; however, timber was maximized for only 10 years. Sufficient surplus inventory remains available for harvest to discourage investments in timber stand management; more in E than in D. Growth in 2030 is consequently lower.

d. The 1980 Forestry Program For Oregon (FPFO)

The Forestry Program for Oregon (FPFO), published in 1977 and updated in May 1982, is an action program designed by the Oregon State Board of Forestry to address current issues on management and allocation of Oregon's forest resources. The Board recommends that National Forests examine their harvest schedules and take advantage of the allowable cut effect to achieve FPFO harvest levels as demonstrated by the 1980 Oregon Timber Supply Assessment (Oregon State Forestry Department, December 1980).

The FPFO has defined three objectives and three levels of attainment for each objective. Table II-14 defines these levels and objectives and displays the extent to which the alternatives for the Forest are consistent with them.

Level I for all FPFO Objectives

The target levels used in the 1980 Forestry Program For Oregon were based on 1979 Forest Service data. As

Table II-14

The Relationship Of The Proposed Action And Alternatives To The Basic Objectives Of The Forestry Program For Oregon

FPFO BASIC OBJECTIVE	LEVEL 1 ^{1/}	LEVEL 2 ^{2/}	LEVEL 3 ^{3/}	DISCUSSION
OBJECTIVE 1: To maintain the maximum potential commercial Forest land base consistent with other resource uses while assuring environmental quality.		NC, C	A, B, D, F, G, H, I	1a. Congressional Acts and Executive Orders (see Purpose and Need section) and State law (Oregon Forest Practices Act) mandate management guidelines for certain lands. Incorporated throughout the planning process, these guidelines have served to define the suitable land for timber production that is compatible with the objective.
Oregon Department of Forestry Compatibility Standard: Alternatives are compatible with objective if the acres suitable for timber management meet or exceed the suitable land base used in the maximum present net value benchmark run, constrained by MMR's.				1b. Oregon Dept of Forestry has stated the Forestry Program for Oregon acknowledges the need for minimum levels of environmental protection. While the Department believes that some MMR's may unnecessarily restrict timber management, they suggest the use of the PNW with MMR's benchmark as the best available land base standard for comparison.
OBJECTIVE 2: To identify and implement economically feasible levels of intensive forest management required to achieve cost effective growth and harvest.		B, C	NC, A, D, E, F, G, H, I	2a. A full range of intensive timber management practices (refer to Management Area discussion, this chapter, and discussion of timber intensities in Appendix B) is utilized for timber production. New and improved practices would be implemented consistent with technological advances.
ODF Compatibility Standard: An alternative is compatible with the objective if the alternative equals 90 percent or more of the number of acres allocated to full timber yield in the maximum present net value benchmark, constrained by MMR's.				2b. The Oregon Department of Forestry defines the full timber yield as the maximum economic yield constrained by a 95 percent culmination of mean annual increment. Again, using the MMR constrained acres as a standard does not mean the Department approves of all MMR strategies. The maximum PNW benchmark identifies the economically feasible levels of Forest Management for this analysis.
OBJECTIVE 3: To maintain community stability by remaining flexible for increases in future harvest levels that would offset projected shortages.		NC, A, B, C, D, E	F, G, H, I	3a. Deviation from sustained yield management would be implemented consistent with NFMA regulations and Forest Plan direction. This involves the harvest of available surplus old-growth inventory to offset projected shortages.
ODF Compatibility Standard: An alternative is compatible with this objective if the number of jobs and income levels and payments to counties meets or exceed the current direction levels of these parameters during the first decade.				3b. The Forestry Program addresses timber harvest scheduling and the resulting effects on local communities and the economy of the State. For most Oregon National Forests, the Oregon Dept. of Forestry has stated that departure from non-declining evenflow will be necessary to maintain overall economic stability as private industrial harvests inevitably decline. The three parameters listed will be measured to determine how each alternative maintains, improves, or decreases economic stability. The Dept. believes that although the Current Direction alternative on some Forests may not accurately represent the existing situation, it provides the best available basis for this comparison.

1/Meets share of FPFO target level and is compatible with basic objective. No alternatives meet this level.

2/Is compatible with the basic objective but does not meet target level or meets the target level but is not compatible with the objective.

3/Does not meet target level and is not compatible with the basic objective.

such, they did not reflect Wilderness created in 1984 or NFMA-mandated changes in land suitable for timber production or requirements for MMRs. For these reasons, none of the Forest alternatives meet FPFO's Level I, which is a 111.3 cubic feet/year (approximately 565 million board feet/year) timber target, for all three FPFO objectives. These differences in assumptions regarding suitability for timber production account for most of the difference in LTSYC between Alternative C and the FPFO target.

Table II-15 compares the original targets, a later 1985 ODF analysis, and Alternative C, which comes closest of any alternative to meeting the targets. The later analysis was performed on the full tentatively suitable timber base of 647,000 acres. The difference between these results and Alternative C are primarily due to MMRs and difference between the analytical models used.

The following discussion provides an interpretation of the three FPFO objectives in the context of the Forest's alternatives and the Forest's timber program.

Table II-15

Ability to Meet Mt. Hood Forest Share of FPFO Target Levels

(Millions of Cubic Feet Per Year)

Decade	Original FPFO Targets	Later ODF Analysis	Alternative C
1	111.3	81.5	77.5
2	100.7	81.1	71.9
3	107.7	78.9	71.9
4	105.9	77.2	56.6
5	105.4	77.5	56.6
6	103.6	76.6	56.6
7	101.1	75.4	56.6
8	98.6	74.0	56.6
9	96.4	73.1	56.6
10	95.4	72.1	56.6
Totals	1028 MMCF	774 MMCF	621 MMCF

FPFO Objective 1

MMRs are legally established management requirements. The Forest does not propose any alternatives which do not satisfy MMRs except for Alternative NC. Only Alternatives NC and C will be compatible with the basic objective of maintaining the maximum potential commercial land base. Alternative C reduces the tentatively suitable land base only where the reduction is needed to meet MMRs. All other alternatives impose further reductions on the tentatively suitable land base to assure higher levels of environmental quality.

Table II-16

Proportion Of Potential Timber Land Managed For Full Timber Production

Alternative	Percent of Area Managed
C	100%
B (RPA)	92%
A (No Action)	86%
D	80%
E (Preferred)	76%
G	76%
NC (No Change)	66%
F	65%
I	52%
H	40%

FPFO Objective 2

The areas managed for full timber yield in each alternative are included in Table II-13. Table II-16 expresses the acres of full yield in each alternative as a percentage of that in the Maximum PNW Benchmark. This benchmark reflects MMRs.

Alternative B and Alternative C are compatible with the FPFO objective of at least 90% of potential. However, all alternatives are designed to manage timber in the most economically efficient manner consistent with other multiple-use objectives.

FPFO Objective 3

Levels of jobs, income and payments to counties are addressed later on in this chapter under the Communities Public Issue. Five alternatives provide more county benefits than Alternative A, the No-Action Alternative. Their increased benefits are due largely to increased timber harvest in the first decade as compared to Alternative A.

e. Range Management

Aside from the few acres of permanent range which provide a continuous source of forage on the Forest, the rest of the ranges are transitory. When stands of trees are clearcut, the sites are opened to the growth of grass, forbs, and shrubs until replacement trees grow large enough to shade out range vegetation. The time required for trees to shade out forage is 10 to 30 years after reforestation begins; hence, the term transitory range. Although the quality of forage in transitory ranges diminishes with timber growth, grazing of livestock is possible for most of the cycle.

Table II-11 includes a comparison of the amount of livestock grazing that would occur under each alternative. Because changes in forage are based almost entirely on the amount of timber harvested, the number of animal unit months supported by the Forest varies according to the area managed for timber.

2. Public Issue 2: Fish Habitat and Water Quality

Figures II 4 and II-5 reflect two indicators of responsiveness of the Forests alternatives to the Fish Habitat and Water Quality Public Issues. The first figure displays projections of the aquatic habitat stability index. This index gauges the stability of the productive capability of aquatic habitat for fish habitat and water quality, given a "normal" level of both natural (windstorms, floods, drought, etc.) and management-related (timber harvest, road building, etc.) disturbances. The model which is used to generate index scores integrates four variables:

- Sediment delivery to aquatic ecosystems above an estimated background level.
- A weighted total of acres selected for riparian resource management.
- Acres of land allocations having high compatibility with the objectives of riparian resource management.
- Total acres of trees in the 0 to 30 year age class.

Index scores can range from 0, indicating lowest relative stability conditions, to 10, reflecting highest stability. A more detailed discussion of this model and its projections, limitations, etc. is included in Chapter IV.

Figure II-4

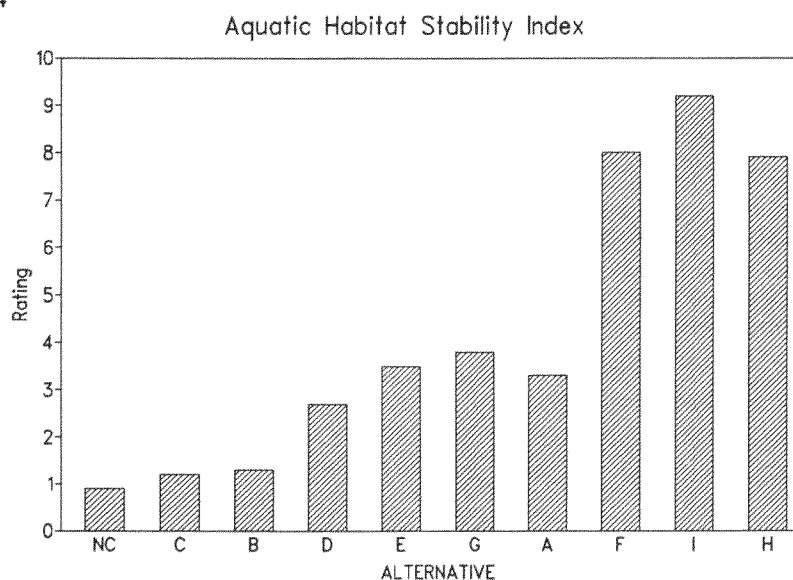


Figure II-5

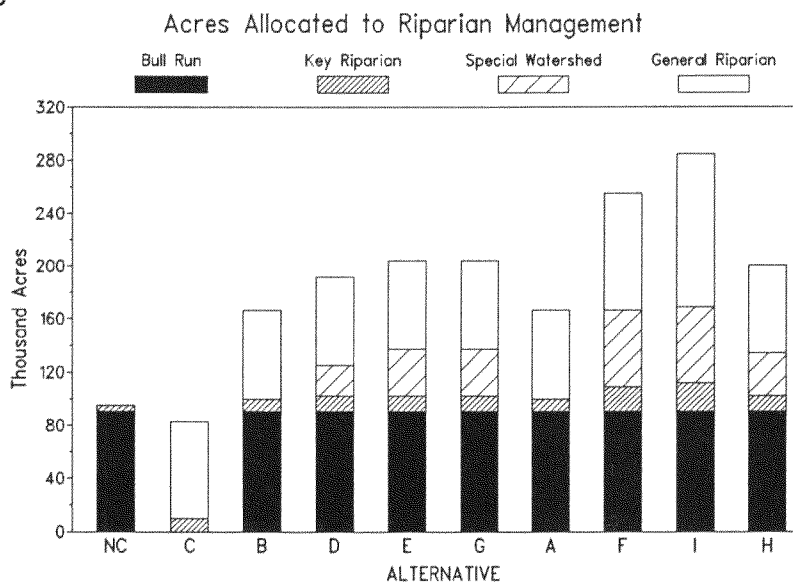


Figure II-5 provides another indication of responsiveness to the Fish Habitat and Water Quality Public Issues. It displays the total area which is managed for riparian resources by alternative. Fish habitat and water quality are two major riparian resources. Land allocations are made and direction is designed specifically to emphasize proactive management of these resources. A mix of riparian resource allocations and a variety of mitigating measures are used to address water quality concerns. However, the relative degree of management emphasis for fish habitat and water quality varies directly with the total acres managed for the riparian resources displayed below.

A separate element, or aspect, of the Fish Habitat and Water Quality Public Issue is the extent to which the Bull Run Watershed will be managed to provide high quality water. In all alternatives except C, the watershed is managed according to direction contained in the Bull Run FEIS, 1979. In Alternative C, however, management emphasis is changed from the production of high quality water, to joint management for both water and timber.

Table II-17 presents some of the more significant outputs and indices reflecting productive capability for fish habitat and water quality. None of these outputs were predetermined or fixed; the FORPLAN model and/or

Table II-17

Outputs Related To The Fish Habitat And Water Quality Issue

OUTPUT OR EFFECT	UNIT OF MEASURE	A L T E R N A T I V E									
		NC No Change	C	B (RPA)	D	E (Preferred)	G	A No Action	F	I	H
Salmonoids (Smolt) ¹	Index										
1st Decade		100	100	100	100	100	100	100	100	100	100
2nd Decade		90	100	100	100	107	107	100	128	150	128
5th Decade		75	100	100	100	107	107	100	128	150	128
Legal Trout ¹	Index										
1st Decade		100	100	100	100	100	100	100	100	100	100
2nd Decade		93	100	100	100	103	103	100	113	123	113
5th Decade		80	100	100	100	103	103	100	113	123	113
Water Yield	Thousand Acre Feet										
1st Decade, Ave. Annual		5,446	5,446	5,446	5,446	5,446	5,446	5,446	5,446	5,446	5,446
2nd Decade, Ave. Annual		5,446	5,446	5,446	5,466	5,446	5,446	5,446	5,446	5,446	5,446
5th Decade, Ave. Annual		5,446	5,446	5,446	5,446	5,446	5,446	5,446	5,446	5,446	5,446
Sediment Delivery	Index										
1st Decade, Ave. Annual		44.5	44.1	37.8	37.1	34.8	31.7	31.3	26.2	24.7	21.1
2nd Decade, Ave. Annual		39.7	42.2	35.8	33.1	31.7	31.0	33.1	27.4	25.9	21.7
5th Decade, Ave. Annual		30.9	31.3	29.7	25.9	25.9	25.7	25.7	22.6	21.8	23.0
Wildlife and Fish Use	Thousand WFUD										
1st Decade, Ave. Annual		289	289	289	289	289	289	289	289	289	289
2nd Decade, Ave. Annual		308	303	303	314	315	315	315	316	318	319
5th Decade, Ave. Annual		383	364	364	441	444	444	442	447	454	460
Anadromous Fish Commercial Harvest	Thousand Pounds										
1st Decade, Ave. Annual		491	491	491	491	497	497	491	546	582	546
2nd Decade, Ave. Annual		Decline	491	491	491	506	506	491	631	656	631
5th Decade, Ave. Annual		Decline	491	491	491	507	507	491	641	656	641
Anadromous Fish Habitat Improvement	Thousand Pounds										
1st Decade, Ave. Annual		1.0	1.0	1.0	1.0	1.3	1.3	1.0	3.0	4.6	3.0
2nd Decade, Ave. Annual		7.5	7.5	7.5	7.5	12.0	12.0	7.5	24.5	40.8	24.5
5th Decade, Ave. Annual		7.5	7.5	7.5	7.5	12.0	12.0	7.5	24.5	40.8	24.5

1/ 100 is current potential habitat capability of 2,622,000 smolts, and 844,700 trout. Index value requires full funding, implementation and maintenance of mitigation measures and rehabilitation work for watershed and riparian areas. Five alternatives require additional mitigation funds: NC = \$775,000, C = \$850,000, B = \$650,000, D = \$510,000, and A = \$400,000.

2/ Wildlife or fish user days. A user day is 12 hours; the equivalent of two people visiting the Forest for 6 hours, one person for 12 hours, etc.

other analytical techniques were used to derive these estimates. Several are extrapolations from the Aquatic Habitat Stability Index. Many of these outputs do not vary by alternative. This is based on the assumption that because of changing alternative emphasis, variable investments for mitigation and rehabilitation will be required to maintain output capability at about present levels for Alternatives A, B, C and D. In Alternative NC projections show that investments are insufficient to maintain present output capabilities. In other alternatives, additional acre allocations to riparian resources management areas and variable investments in addition to mitigation and rehabilitation, termed enhancement, are expected to increase selected output capabilities relative to the present.

3. Public Issue 3: Wildlife Habitat

There is an overlap between Public Issues 2 and 3; fish habitat and water quality management often benefits wildlife objectives and vice-versa. From a programmatic view it is often necessary to separate the two objectives.

Figure II-6 portrays the quantity of acres to be managed to meet specific wildlife habitat needs. Alternative NC is not shown because the existing Timber Management Plan does not explicitly designate wildlife management areas.

Table II-18 presents some of the more significant wildlife habitat related outputs. These outputs were not fixed; the FORPLAN model and/or other analytical techniques were used to derive these amounts.

As was the case with the Fish Habitat and Water Quality Public Issue, mitigation measures tend to insure that current levels of wildlife are maintained in the high timber harvest alternatives: A, B, C, D, E, and NC. In the other alternatives, additional land allocations to wildlife management areas and enhancement expenditures generally improve habitat conditions and, consequently, numbers of wildlife over the present situation.

The "old growth" and "young growth" data shown in Table II-18 have been chosen as the indicators of responsiveness of the alternatives to Public Issue 3, Wildlife Habitat. The Figure II-7 portrays these statistics in graphic form.

Table II-18
Outputs Related To The Wildlife Habitat Question

OUTPUT AND/OR EFFECT	UNIT OF MEASURE	A L T E R N A T I V E									
		NC (No Change)	C	B (RPA)	D	E (Preferred)	G	A (No Action)	F	I	H
MANAGEMENT INDICATOR SPECIES:											
Spotted Owls	Pairs										
1st Decade		35	80	80	85	85	85	80	101	120	148
2nd Decade		35	80	80	85	85	85	80	101	120	148
5th Decade		35	80	80	85	85	85	80	101	120	148
Pileated Woodpeckers	Pairs										
1st Decade		0	102	102	102	102	102	102	133	163	102
2nd Decade		0	102	102	102	102	102	102	133	163	102
5th Decade		0	102	102	102	102	102	102	133	163	102
Pine Martens	Pairs										
1st Decade		0	231	231	231	231	231	231	300	369	231
2nd Decade		0	231	231	231	231	231	231	300	369	231
5th Decade		0	231	231	231	231	231	231	300	369	231
Silver Grey Squirrels	Numbers										
1st Decade		4,900	4,900	4,900	3,400	3,400	4,900	4,900	4,900	4,600	4,600
2nd Decade		12,900	10,300	10,300	8,900	9,200	10,500	10,400	11,200	11,500	13,800
5th Decade		14,100	16,100	13,500	13,200	14,000	14,100	13,800	16,700	17,200	18,700
Turkeys	Numbers										
1st Decade		1,000	1,100	1,100	700	700	1,000	1,000	1,000	900	1,000
2nd Decade		2,600	2,100	2,100	1,800	1,800	2,100	2,100	2,200	2,300	2,700
5th Decade		2,800	3,200	2,700	2,600	3,300	2,600	2,700	3,300	2,700	2,800
Deer	Numbers										
1st Decade		18,000	22,100	20,800	19,500	9,200	27,300	24,000	32,800	88,500	30,000
2nd Decade		14,000	23,400	20,800	19,500	27,300	23,400	14,000	27,300	66,300	16,400
5th Decade		11,000	10,400	11,700	31,200	13,600	14,600	13,200	16,400	36,900	21,800
Elk	Numbers										
1st Decade		2,700	3,300	3,100	2,900	4,300	4,000	3,600	4,800	13,000	4,400
2nd Decade		2,100	3,500	3,100	2,900	4,000	3,500	2,800	4,000	9,800	2,400
5th Decade		1,700	1,500	1,700	4,600	2,000	2,000	1,900	2,400	5,400	3,200
OTHER OUTPUTS:											
Old Growth	Acres ¹										
Presently		346,400	346,400	346,400	346,400	346,400	346,400	346,400	346,400	346,400	346,400
After 50 years		270,500	193,500	216,200	249,900	264,300	273,100	276,100	315,000	342,400	409,300
Young Growth	Acres ²										
Presently		108,100	108,100	108,100	108,100	108,100	108,100	108,100	108,100	108,100	108,100
After 50 Years		105,100	101,800	85,200	87,800	67,400	73,300	68,400	60,200	62,600	36,000
Wildlife and Fish Use	M WFUD ³										
1st Decade, Ave/Yr		288,800	288,800	288,800	288,800	288,800	288,800	288,800	288,800	288,800	288,800
2nd Decade, Ave/Yr		307,900	303,300	303,300	314,300	314,900	314,900	314,500	315,900	317,500	319,000
5th Decade, Ave/Yr		382,800	364,300	364,300	441,100	443,600	443,600	441,600	447,200	453,600	459,900

1/ Stands of trees 200 years of age or older. 2/ Stands of trees 20 years of age or younger. 3/ Thousands of wildlife or fish user days.

Figure II-6

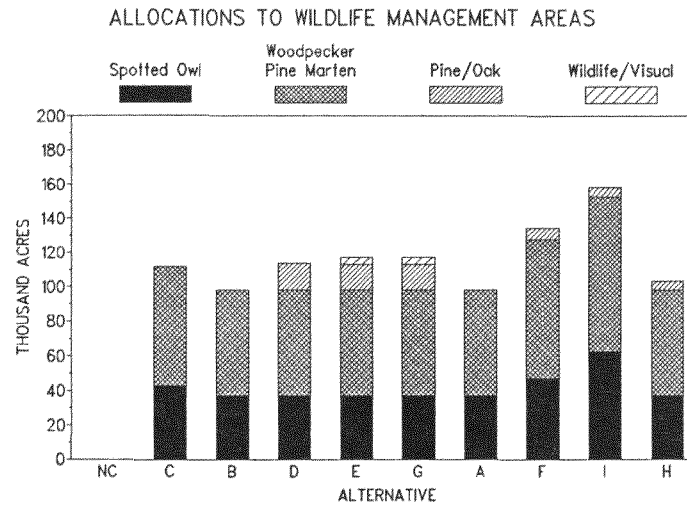
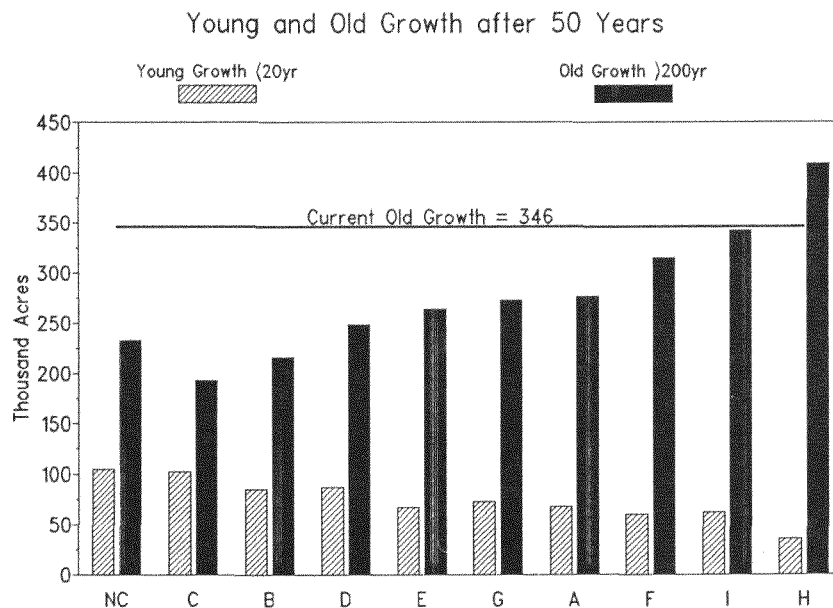


Figure II-7



4. Public Issue 4: Recreation

a. Introduction

The Mt. Hood National Forest is the eighth most visited national forest in the United States. It is the most visited forest in the State of Oregon. Multnomah Falls, located within ten minutes walking distance from Interstate Highway 84 in the Columbia River Gorge National Scenic Area, is visited by upwards of two million people a year. Timberline Lodge, a national historic landmark in a year-round skiing area, is visited more than one million times per year. These are examples of developed recreational opportunities.

The current supply of opportunities is spread among the management areas as follows:

Area A10 (Developed Recreation) = 3 million RVDs/yr
= 51% of Total

Area C1 (Timber Emphasis) = 0.82 million RVDs/yr
= 14% of Total

Area A2 (Wilderness) = 0.14 million RVDs/yr = 2%
of Total

All Other Areas = 1.93 million RVDs/yr = 33%
of Total

For the purposes of this discussion, "dispersed recreation" is defined as occurring outside of areas managed to concentrate use, developed areas (Management Area A10), and outside of Wilderness (Management Area A2). On this Forest, dispersed recreation is subdivided into four Recreation Opportunity Spectrum (hereafter abbreviated as ROS) categories: Semi-Primitive Non-motorized (SPNM), Semi-Primitive Motorized (SPM), Roaded Natural (RN), and Roaded Modified (RM). Kinds of recreation provided by these categories is

described in Chapter III. Carrying capacities for each ROS class, which determine supply capability, are explained in Appendix B. Management Area C1 provides Roaded Modified experiences. Management areas other than A2, A10, or C1 provide SPNM, SPM, or RN experiences.

The demand for Wilderness and both types of dispersed semi-primitive categories of recreation already exceeds the amount the Forest can supply. It is expected that, due to increases in population alone, the difference between demand and supply for these types of recreational experiences will increase in the future under any of the alternatives considered. Chapter IV addresses measures which will be taken to limit all types of recreational use to the amount that can be supplied consistently with ROS Standards.

The supply/demand issue is primarily one related to the type and quantity of particular types of opportunities. Another significant facet of the Recreation Public Issue has to do with quality. This is addressed in two ways: (1) the standard of recreational facilities to be provided and (2) the visual condition of viewsheds.

The ID Team, in consultation with the Regional and Washington, D.C. Offices of the Forest Service, proposed the provision of a "standard" level of service under all alternatives. This is intended to meet the demands of the public in a manner which is responsive to changing desires over time. In Forest Service terms, this would entail "Full Service Management" of all types of recreation (Cleaning Recreation Sites, U.S. Dept. of Agriculture, Forest Service Publication 8023 1801, ED&T 9009).

The estimates shown in this document regarding recreational demand were made as follows. Current use figures were obtained from Forest records for each ROS category. These figures were increased at the rate of 1.5 percent per year to estimate increases in demand. This rate is the mid-level projection which the State of Oregon uses to estimate growth of the State's population. This rate also matches the approximate trend in increasing use of all types of recreation on the Forest for the last 20 years.

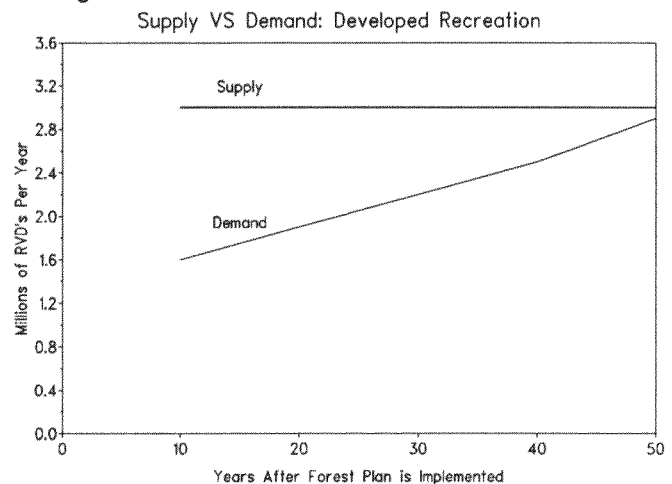
b. Developed Recreation

Supply = 3.0 MM RVDs Per Year

Demand = 1.6 MM RVDs (Year 10), 1.9 (Year 20),
2.2 (Year 30), 2.5 (Year 40), 2.9 (Year 50)

Management of developed recreation sites does not change by alternative. Under any of the alternatives considered, the existing quantity of developed RVDs will be supplied for the next fifty years. This is sufficient to meet demand.

Figure II-8



About \$900,000 per year is currently spent on developed recreation administration, operation and maintenance. This is resulting in the provision of less than standard level of service. About \$2,200,000 per year is needed to bring facilities back up to the standard level and keep them there. This will result in the reconstruction of developed recreation sites to increase 275 PAOT per year to the standard level of service during the first decade. PAOT is an acronym for Persons At One Time. The average campsite provides for about 5 PAOT.

c. Wilderness Recreation

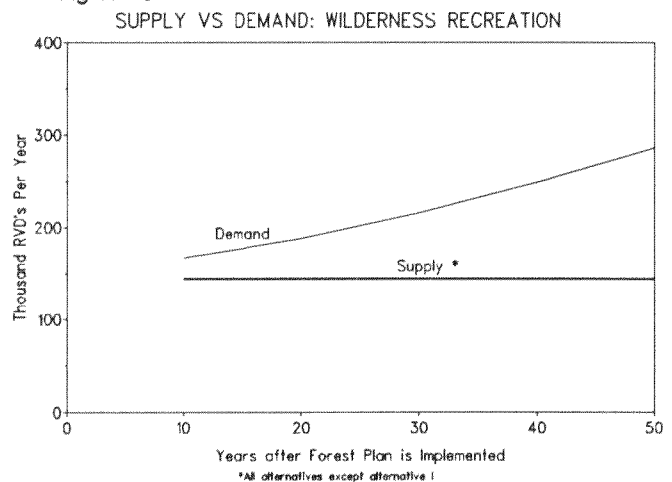
Supply = 144,000 RVDs Per Year, All Alternatives *

Demand = 167,000 RVDs (Year 10),
188,000 (Year 20), 216,000 (Year 30),
249,000 (Year 40), 286,000 (Year 50)

* Alternative I Supply = 151,000 RVDs Per Year for Next 50 Years

Figure II-9 shows that, under any of the alternatives considered, the existing quantity of Wilderness RVDs demanded by the public on the Mt. Hood National

Figure II-9



Forest cannot be met by any of the alternatives considered. This demand/supply deficit increases in the future. The 1984 Oregon Wilderness Act prohibits the Forest from recommending any additional areas, other than in the Olallie Further Planning Area, for Wilderness during the next 10 years (see Appendix C for details). Alternative I includes the unroaded portion of the Olallie Area as Wilderness. Even so, the extra 7,000 RVDs per year is not nearly enough to bring Alternative I's supply of Wilderness opportunities up to the existing demand level.

About \$100,000 per year is currently spent on Wilderness administration and management. This is resulting in the provision of less than standard level of service. About \$300,000 per year is needed to provide the standard level of service and facilities in Wilderness. This includes trail reconstruction and maintenance.

d. Dispersed Recreation

Table II-19 quantifies the supply/demand situation with respect to the four ROS categories of dispersed recreation analyzed.

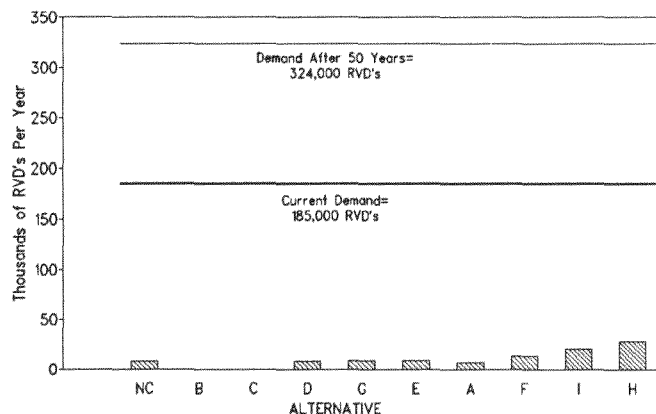
Table II-19
Supply vs Demand For Dispersed Recreation
(Millions of RVDs/Year)

	TYPE OF DISPERSED RECREATIONAL EXPERIENCE											
	Semi-Primitive Non-Motorized			Semi-Primitive Motorized			Roaded Natural			Roaded Modified		
	Decade 1	Decade 2	Decade 5	Decade 1	Decade 2	Decade 5	Decade 1	Decade 2	Decade 5	Decade 1	Decade 2	Decade 5
DEMAND	0.246	0.283	0.431	0.185	0.213	0.324	1.500	1.696	2.965	0.818	0.925	1.407
Alternative(s)	AMOUNT SUPPLIED BY EACH ALTERNATIVE (capacity)											
NC (No Change)	0.218	0.179	0.061	0.085	0.066	0.008	1.500	1.634	2.037	0.818	2.359	6.982
B (RPA) and C	0.218	0.165	0.003	0.085	0.064	0.000	1.500	1.608	1.933	0.818	2.476	7.447
D	0.218	0.177	0.054	0.085	0.066	0.008	1.500	1.930	3.220	0.818	2.040	5.706
E(Preferred) and G	0.218	0.182	0.075	0.085	0.066	0.009	1.500	2.092	3.867	0.818	1.831	4.870
A (No Action)	0.218	0.178	0.059	0.085	0.066	0.007	1.500	2.101	3.903	0.818	1.844	4.920
F	0.218	0.190	0.105	0.085	0.067	0.013	1.500	2.669	6.175	0.818	1.144	2.121
I	0.218	0.203	0.157	0.085	0.069	0.020	1.500	2.648	6.092	0.818	1.068	1.817
H	0.218	0.215	0.206	0.085	0.071	0.028	1.500	2.468	5.372	0.818	1.219	2.419

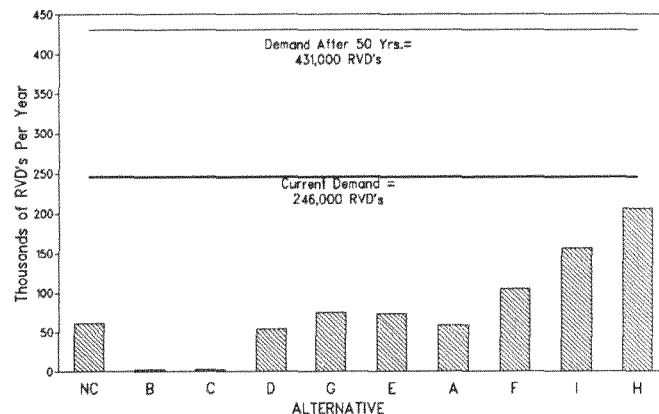
Figure II-10

Figure II-11

Supply of Dispersed, Semi-Primitive
Motorized Recreation after 50 Years



Supply of Dispersed, Semi-Primitive
Non-Motorized Recreation after 50 Years



Most roaded modified RVDs are supplied as a function of timber harvesting in Management Area C1. Most roaded natural RVDs result from the less intensive harvesting which occurs in the Category B Management Areas. By the fifth decade all of the alternatives will supply enough roaded modified RVDs to meet projected demand. All but alternatives NC, B, and C will also meet the demand for roaded natural opportunities at that time.

All of the alternatives will fall short of meeting demand for semi-primitive motorized or non-motorized opportunities in the fifth decade. Figures II-10 and II-11 show that some alternatives will do much better than others in trying to make up for this shortfall. The level of supply of dispersed semi-primitive RVDs is a measure of responsiveness to the Recreation Public Issue.

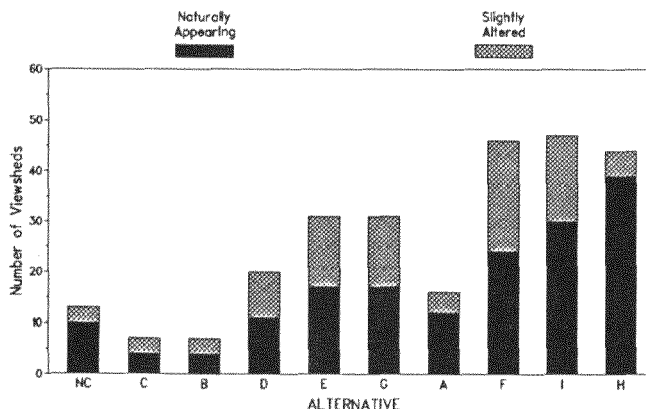
About \$275,000 per year is currently spent on all forms of dispersed recreation management. This is resulting in the provision of less than a standard level of service. About \$525,000 per year is needed in all alternatives to bring facilities back up to the standard level and keep them there. This includes the reconstruction of trails and trailheads in dispersed areas. About 28 miles of trail will be constructed each year in the first decade.

e. Quality Of Viewsheds

The quality of viewsheds affects all forest recreationists, regardless of whether they are seeking a developed, dispersed, or wilderness type of experience. For this reason two indicators of responsiveness to the Recreation Public Issue have to do with how many of the Forest's 48 most sensitive viewsheds will be naturally appearing or only slightly altered in fifty years. The sensitive viewsheds are listed in Chapter IV. Figure II-12 gives this information, as well as the number of viewsheds appearing moderately or heavily altered.

There are about 347,000 acres of the Forest which are classified as "seldom seen". The eventual condition of

Figure II-12
Expected Future Condition of the Forest's Viewsheds
(48 of the Forest's most visually sensitive viewsheds)



the "seen" part of the Forest is addressed in Table II-20 in terms of visual quality objectives.

Table II-20
Expected Visual Condition Of The Forest In 50 Years

ALTERNATIVE	ACRES IN EACH VISUAL QUALITY OBJECTIVE ^{1/}				
	Preservation	Retention	Partial Retention	Modification	Maximum Modification
C	187,200	16,200	3,350	200,400	345,600
B (RPA)	187,200	13,100	12,100	196,600	343,900
NC (No Change)	187,200	81,500	63,100	150,000	271,200
D	187,200	89,400	96,600	196,300	183,400
E (Preferred)	187,200	152,800	148,100	125,700	139,200
G	187,200	152,800	148,100	125,700	139,200
A (No Action)	187,200	98,000	58,300	306,900	102,600
H	188,200	360,900	115,200	77,700	11,000
F	188,200	193,700	286,600	84,500	0
I	196,300	278,900	262,200	15,300	0

1/ See Glossary for definitions of visual categories.

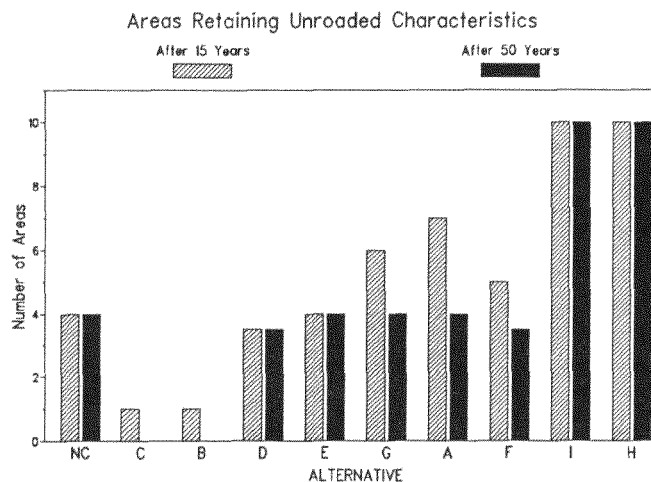
5. Public Issue 5: Unroaded Areas

Appendix C describes 10 non-Wilderness, unroaded areas which were considered for unroaded management. Recreationists desiring unroaded experiences at or near the "primitive" end of the recreation opportunity spectrum depend on such areas in addition to legislated

Table II-21
Disposition Of The Unroaded Areas

DISPOSITION	UNIT OF MEASURE	A L T E R N A T I V E									
		NC	B & C	D	E	G	A	F	H & I		
Roaded First Decade	Number of Areas	6	9	6.5	6	4	3	5	0		
Assigned to roaded management prescriptions, but have no development planned for the next 15 years	Number of Areas	0	1	0	0	2	3	1.5	0		
Assigned to unroaded management prescriptions	Number of Areas	4	0	3.5	4	4	4	3.5	10		

Figure II-13



Wilderness. Certain kinds of plants and animals also find the majority of their needs fulfilled from these areas.

All alternatives have the 185,300 acres of legislated Wilderness assigned to Management Area A2. Only Alternative I adds more acres to this management area, consisting of the 8,100-acre unroaded portion of the Olallie Further Planning Area.

Table II-21 quantifies how many of the 10 unroaded areas will have roads built in them during the first decade, how many will have such activities deferred for the next 15 years, and how many do not have roads planned in them. This data is also portrayed graphically in Figure II-13. Note that the number of areas remaining unroaded after 15 and 50 years are a measure of responsiveness to the Unroaded Area Issue.

Table II-22 names the areas which will be managed in accordance with the standards for Management Area A5, Unroaded Recreation, or other Category A Management Areas which will retain unroaded characteristics

Table II-23

Development Of The Unroaded Areas During The Next 10 Years

ACTIVITY OR OUTPUT	A L T E R N A T I V E									
	NC	C	B	D	E	G	A	F	I	H
Thousands of Acres Roaded	10	21	20	11	7	6	5	2	0	0
Green, Chargeable Volume (MMBF)	225	631	619	364	279	192	78	59	0	0
Roading Cost (Million \$)	9	29	28	16	12	8	4	2	0	0

Table II-22

Areas To Be Managed To Retain Unroaded Characteristics

ALTERNATIVE	AREAS SPECIFICALLY ASSIGNED TO UNROADED RECREATION MANAGEMENT	AREAS ASSIGNED TO OTHER MANAGEMENT AREAS WHICH INCIDENTALLY PROTECT UNROADED CHARACTERISTICS	TOTAL AREAS
NC (No Change)	None	Eagle, Olallie, Larch Mt., Roaring River	4.0
C	None	None	0.0
B (RPA)	None	None	0.0
D	Small part of Eagle	Olallie, Roaring River, major part of Eagle, plus half of Larch Mt.	3.5
E (Preferred)	Small part of Eagle	Olallie, Roaring River, major part of Eagle, plus half of Larch Mt. and half of Wind Creek	3.0 +0.5 +0.5 4.0
G	Small part of Eagle	Same as Alternative E	4.0
A (No Action)	None	Eagle, Olallie, Larch Mt., Roaring River	4.0
F	Bull of the Woods, Roaring River	Eagle, half of Larch Mt.	3.5
I	Eagle, Larch Mt., Wind Creek, Twin Lakes, Bull of the Woods, Mt. Hood Additions, Salmon/Huckleberry, Badger/Jordan	Roaring River Olallie	10
H	Eagle, Larch Mt., Roaring River, Olallie, Wind Creek, Twin Lakes, Bull of the Woods, Mt. Hood Additions, Salmon/Huckleberry, Badger/Jordan	None	10

after 50 years. The names used in this table, such as Bull of the Woods, are those used to denote the 10 unroaded areas in Appendix C, DEIS. The fractional amount of 0.5 denotes contiguous portions encompassing roughly half of an area's total acreage.

Table II-23 displays some of the costs and benefits associated with development of the 10 unroaded areas during the next 10 years.

6. Public Issue 6: Dependent Communities

a. Introduction

All of the management area designations affect communities in one way or another. Communities such as Government Camp are strongly influenced by nearby management areas emphasizing recreational objectives whereas communities such as Molalla or Tygh Valley are more affected by the timber coming from Category B and C Management Areas. Communities with either recreation or timber based economies benefit from Forest Service expenditures. There are also seven Forest Service Ranger Districts, each employing people who use and pay for the services of local communities.

Recreation based economies rely on jobs resulting from dollars spent by recreationists on gasoline, fishing tackle, motels, food, ski lift tickets, etc.

Timber based economies rely on jobs and "25 percent fund" receipts resulting from harvests on the Forest. These receipts are one quarter of the gross revenues paid to the U. S. Treasury for Mt. Hood National Forest products and services. The amount of "25 percent fund" receipts paid to individual counties during FY 80-4 is noted in Chapter III. Approximately ninety percent of these receipts result from the harvesting of timber. The future supply of timber is thus an indicator of how much the Forest Service will pay to the aggregation of counties comprising the Forest. In addition to these "25 percent fund" receipts from the sale of commodity goods and services, the counties receive from the federal government payments in lieu of taxes, which is not related to Forest outputs. The annual average payments in lieu of taxes to the counties for 1980-1984 period was \$123,000.

These figures are estimates based on estimates of future prices as well as output levels, and should not be used by other public agencies as exact projections. The following discussion addresses the supply of timber for the next 50 years.

b. Timber Supply in the Four County Primary Influence Area

As detailed in Chapters III and IV, the Forest's primary economic influence area is identified as Clackamas,

Hood River, Multnomah, and Wasco Counties. This Forest is the only National Forest occurring in these counties. The section titled "Timber Supply and Projections in the Four County Influence Area" in Chapter III presents historical data on supply from each major category of landholder. It is noted that the Forest has historically provided about two thirds of the total volume harvested in the influence area.

Based on the historical data presented in Chapter III, and on projections by Beuter et. al. (1976), one may assume that the amount supplied by non-Forest landholders will diminish at a rate of about ten percent

Table II-24
Total Projected Harvest In The Forest's Influence Area

DECADE OF FOREST PLAN IMPLEMENTATION	ALTERNATIVE	AVERAGE ANNUAL SUPPLY (MMBF Per Year)		
		Forest Supply	Other Supply	Total
First Decade	NC (No Change)	443	153	596
	C	493	153	646
	B (RPA)	444	153	597
	D	385	153	538
	E (Preferred)	347	153	500
	G	307	153	460
	A (No Action)	316	153	469
	F	239	153	392
	I	202	153	355
Second Decade	H	108	153	261
	NC (No Change)	443	138	581
	C	460	138	598
	B (RPA)	413	138	551
	D	353	138	491
	E (Preferred)	323	138	461
	G	307	138	445
	A (No Action)	316	138	454
	F	239	138	377
Third Decade	I	202	138	340
	H	108	138	246
	NC (No Change)	443	153	596
	C	465	153	618
	B (RPA)	387	153	540
	D	354	153	507
	E (Preferred)	323	153	476
	G	307	153	460
	A (No Action)	316	153	469
Fourth Decade	F	239	153	392
	I	202	153	355
	H	113	153	266
	NC (No Change)	443	168	611
	C	387	168	555
	B (RPA)	387	168	555
	D	329	168	497
	E (Preferred)	314	168	482
	G	307	168	475
Fifth Decade	A (No Action)	316	168	484
	F	239	168	407
	I	204	168	372
	H	130	168	298
	NC (No Change)	443	185	628
	C	387	185	572
	B (RPA)	387	185	572
	D	329	185	514
	E (Preferred)	324	185	509
	G	307	185	492
	A (No Action)	316	185	501
	F	275	185	460
	I	238	185	423
	H	151	185	336

per decade for the next 2 decades and then increase 10 percent per decade for the next 3 decades. The harvest levels shown for non-Forest landholders in Table II-24 are predicated on this assumption.

In order to put the "total harvest" numbers shown in the table in perspective, it should be noted that the average total harvest supplied during the 1977-80 period was 549 MMBF per year, and the average for the 1981-84 period was 465 MMBF per year. If 465 MMBF may be taken as an indicator of minimum demand, then alternatives A,

B, C, D, E, and G would meet communities' minimum needs during the first decade of the Forest Plan.

c. Changes in Employment and Receipts to Counties

Figures II-14 and II-15 show the alternatives' effects on the jobs and "25 percent receipts" in the Forest's four county primary influence area.

Figure II-14

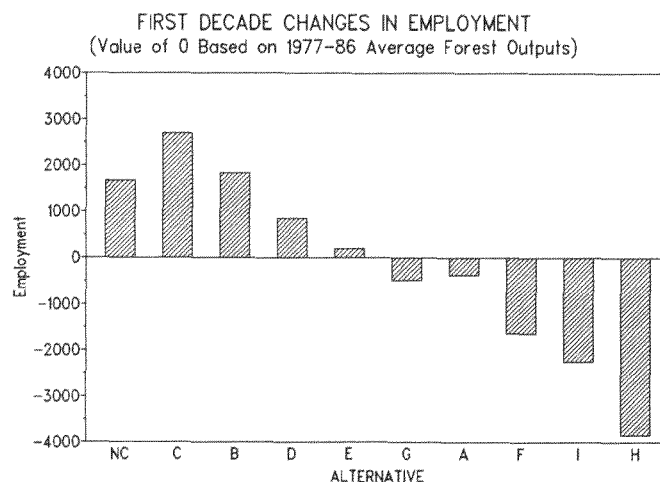
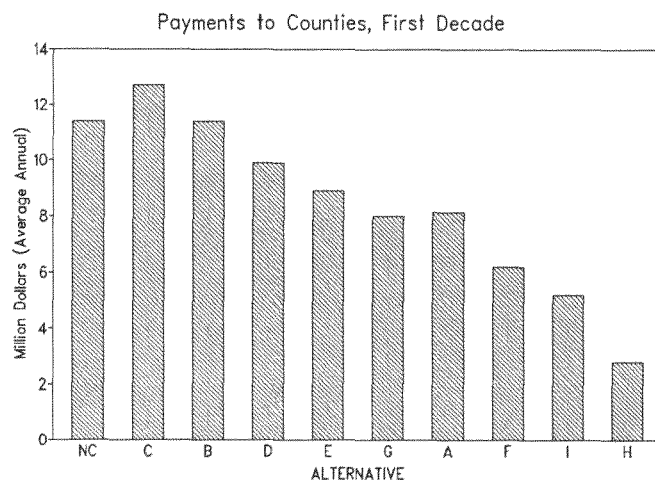


Figure II-15



Note that these payments are from commodity sales only and vary by alternative. Payments to counties in lieu of taxes, discussed on the previous page, are in addition to these payments and do not vary by alternative.

d. Minerals Program

Development of mineral resources could provide economic benefits to nearby communities, similar to those produced by timber harvest. However, the alternatives do not propose various levels of mineral activities. Rather, the alternatives provide management direction

for managing the surface resources when mineral exploration takes place or minerals are developed. This direction may affect potential mineral exploration or development by encouraging, restricting or eliminating access for such purposes. In some areas under some alternatives, lands may be withdrawn from mineral entry and the mining or leasing laws. Different alternatives have different recommendations for denying or restricting access to these areas by withdrawing them from mineral access or providing special management directions. The resulting differences in access affect the availability of Forest lands for mineral exploration, development, and reclamation. In such cases potential mineral resources may never be identified or developed. When management goals for other resources cannot be fully met in conjunction with certain types of mineral activities, the result is a conflict of interests. Alternatives with highly restrictive access would be most likely to generate conflicts.

(1) Locatable Minerals

Most locatable mineral activity has occurred on the Oak Grove Fork of the Clackamas River. As described in the minerals section of Chapter III, operations in this mining district have been small and intermittent. The mineral potential of the District is moderate and concentrated primarily on the possible development of cinnabar (mercury ore). The rest of the Forest is low in locatable mineral potential as discussed in the minerals section of Chapter III, DEIS.

Known locations of locatable minerals do not change with alternatives, but the availability of minerals does. The conflicts mentioned above could occur in areas where claims were made prior to mineral withdrawal, or where existing claims have been located in management areas subject to recommendations for mineral withdrawal. Highly restricted access due to management area direction can discourage exploration and development for locatable minerals in certain Forest areas. Where valid mineral rights do not now exist, and the standards withdraw the area from mineral exploration and development, mineral claims would be prohibited. Table II-25 lists the percent of locatable mineral acres with moderate potential in restricted areas.

(2) Mineral Leasing

With a valid permit, people can explore for leasable minerals on all public lands not withdrawn from mineral leasing laws. In an area where valid existing mineral rights do not already exist, leases and permits may be granted under the provisions of all alternatives only if these leases and permits incorporate the management direction of the lease/permit area. If an area has been leased, the lessee has the right to explore, produce, and develop leasable minerals with reasonable access. Where

Table II-25
Percent Of Locatable Mineral Acres With Moderate Potential In Restricted Areas

ACCESS RESTRICTIONS*	MINERAL POTENTIAL (See Chapter III)	ALTERNATIVES 1,000's OF ACRES									
		NC	C	B	D	E	G	A	F	I	H
Withdrawn	Moderate	0	0	0	0	0	0	0	0	0	0
Highly Restricted	Moderate	15	18	18	0	31	31	15	29	25	86
Moderately Restricted	Moderate	0	0	0	49	69	69	0	71	75	14
Low Restrictions	Moderate	85	82	82	51	0	0	85	0	0	0

*Access restrictions in terms of the degree to which management prescriptions restrict mineral activities such as prospecting, exploration, and development are:

- Withdrawn: exclusion of land from mineral entry. Valid existing rights are determined and recognized.
- Highly Restricted: withdrawal from mineral entry recommended for limited areas only when found to be necessary. Maximum resource protection is emphasized and special stipulations are to be used.
- Moderately Restricted: Management goals can be accomplished with few stipulations on mineral activities. For example, period(s) of operation could be restricted.
- Low Restrictions: mineral exploration and development to be encouraged with minimum restraints.

other management goals cannot be completely achieved while leasing activities continue, conflicts may arise. Conversely, management prescriptions could impair access to leasable minerals. Impacts of management prescriptions could affect the type of mineral leasing activity permitted, the quality of information acquired about the potential and occurrence of the mineral resource, and the ability of the lessee to supply minerals to meet national demands.

Geothermal resources are considered to be a leasable mineral. Geothermal exploration and possibly development activity is expected to continue and could increase. Management decisions that would restrict access, prospecting, and exploration would interfere with obtaining full knowledge of these resources. Where geothermal resources are known to exist, but their economic potential has not been determined, management decisions could limit exploration and development.

Management area direction limits geothermal exploration activities mainly by restricting access. The most restrictive access would be mineral withdrawal, thereby denying mineral entry altogether. In some of the alternatives, mineral withdrawal is proposed in several management areas such as wild segments of wild and scenic rivers. Wildernesses, for example, have already been withdrawn. The number of high mineral potential areas impacted by this restriction varies little between alternatives. Differences between alternatives are caused when

access is highly restricted for other reasons. Highly restricted management areas emphasize:

- Unroaded Recreation - No Timber Harvest
- Developed Recreation Sites (ski areas and campgrounds)
- Special Interest Areas
- Key Site Riparian Habitat and Special Emphasis Watersheds
- Northern Spotted Owl Habitat Areas (SOHA), Pileated Woodpecker/Pine Marten Habitat
- Wild, Scenic and Recreation Rivers, and Scenic Viewsheds.

In high mineral potential areas, withdrawal from mineral entry may be recommended for limited areas, surface occupancy could be denied, certain types of mineral activities may be limited, or road access may be denied. These types of restrictions are needed to assure maximum resource protection required by management area standards.

In moderately restrictive management areas, access to minerals is assured when management area prescriptions are compatible with most mineral activities. The goals of such management areas can normally be accomplished with few mineral limitations, although the period of operation may be limited. Management areas

Table II-26
Restrictions on Geothermal Resources (Acres)

ACCESS* RESTRICTIONS	MINERAL** POTENTIAL (See Ch. III)	ALTERNATIVES									
		NC	A	B	C	D	F	E	G	H	I
Withdrawn or Recommended for Withdrawal from Mineral Entry	High	0	7,054	6,855	6,855	6,976	6,930	6,713	6,713	6,876	6,717
	Moderate	0	18,943	19,631	19,631	17,438	19,185	19,547	19,547	17,517	25,140
Highly Restricted	High	3,410	4,412	2,527	2,527	3,973	8,109	5,837	5,738	7,127	6,598
	Moderate	79,036	93,583	31,380	31,380	70,872	184,854	113,218	113,218	173,303	177,552
Moderately Restricted	High	0	0	0	0	338	333	416	416	57	369
	Moderate	0	0	0	0	6,025	15,448	6,495	6,495	21,076	22,236
Low Restrictions	High	7,808	6,806	8,812	8,812	6,110	1,928	4,263	4,263	3,319	4,013
	Moderate	163,449	148,902	210,495	210,495	167,968	42,913	123,311	123,311	50,425	37,075

that protect viewsheds and earth flows are moderately restrictive to mineral access.

Table II-26 identifies (a) the number of acres in high and moderate potential geothermal resource acres, and (b) access restrictions on those acres. The total acres of high and moderate potential mineral resources do not vary between alternatives. Nearly 40 percent of all high potential geothermal resources on the Forest would be withdrawn and unavailable.

(3) Saleable/Common Variety Minerals

Different management areas vary in the ways they affect rock and gravel resources. Rock quarries would be prohibited in the following management areas: Developed Recreation Sites, Unroaded Recreation, Wild, Scenic and Recreation Rivers, Northern Spotted Owl Habitat, and Wilderness. Restrictions would be high in Scenic Viewsheds and Key Site Riparian Habitat. Quarry operations would be restricted where the quarries are located within areas designated for wildlife management by an alternative. Similar seasonal restrictions would apply to quarries in Pine/Oak Habitat and in Winter Range.

Most of the rock and gravel used on the Forest goes into timber harvest roads. Alternatives I, H, G, and F call for relatively high restrictions on the development of rock mineral resources, but because their harvest levels are less than in other alternatives, the need for rock would be reduced. In all alternatives there is adequate rock in east-side drainages to meet long-term needs. West-side drainages will suffer from rock shortages regardless of the alternative selected. Alternatives differ only in the decade these drainages would become unable to supply the Forest's needs. Rock shortages will occur in certain west-side drainages: Oak Grove Fork, Collawash, Lower Clackamas, Upper Clackamas, and Hot Springs Fork in all alternatives within five decades. Deficiencies occur earliest in Alternatives NC, B, and C due to their

high harvest levels. (Refer to Chapter III for locations of drainages)

The use of lower quality rock could help to meet the supply deficit, but rock from low-quality sources would do little to satisfy long-term needs. The most likely answer to the shortage problem would be to supply rock from quarries outside a seven-mile haulage distance or from off-Forest sources. This practice would increase the cost of roads considerably.

(4) The Dalles Watershed

So far this watershed area has not been withdrawn from mineral entry, and is not recommended for withdrawal in any alternative. However, access could be denied based on a cooperative agreement, dated 1912, between The Dalles municipality and the Department of Agriculture. Under the terms of this agreement, access for any activity, including minerals, requires approval by the Municipality and the Department of Agriculture. Any denial of mineral access by the Municipality would be in conflict with U.S. mining laws. These laws grant people the right to explore public lands for minerals except in areas withdrawn from mineral entry.

This agreement is superseded by Special Emphasis Watershed standards in any alternatives that list the Dalles Watershed as a Special Emphasis Watershed. The Dalles Watershed is designated as a Special Emphasis Watershed Management Area in all alternatives except A, B, and C.

e. Range Program

Considering the Forest's area of influence as a whole, grazing on the Forest is of little consequence. However, the economies of specific families on the east side may be affected by changes in the Forest's range program. In 1985, 8,700 Animal Unit Months (AUMs) were permitted. AUMs for the alternatives are projected in Table II-11.

E. Economic Efficiency Analysis Of Alternatives

1. Introduction

Economic efficiency analysis is required by the NFMA Regulations, 36 CFR 219, and plays an important role in the development and evaluation of benchmarks and alternatives.

This and following sections explain some of the key concepts and terms used in analyzing economic efficiency. Some of the major differences in the economic consequences of alternatives and their responsiveness to Issues, Concerns, and Opportunities (ICOs) are also discussed. A more detailed discussion of the process used to analyze economic efficiency for each of the benchmarks and alternatives is given in Appendix B.

2. Net Public Benefit

The Regulations, 36 CFR 219.12(f), state that:

The primary goal in formulating alternatives . . . is to provide an adequate basis for identifying the alternative that comes nearest to maximizing net public benefits.

Net public benefits are the overall long-term value of all outputs and positive effects (benefits), less all associated Forest inputs and negative effects (costs) from management activities. Some aspects of these benefits and costs can be quantified with dollar values, and some cannot. Because of this, net public benefits cannot be expressed as a purely quantitative economic measure. Identifying the alternative that maximizes net public benefits, while responding effectively to the Public Issues, is the objective of planning.

3. Present Net Value

Present Net Value (PNV) is one component of net public benefits. It measures the potential economic efficiency of each alternative. PNV is calculated by subtracting the economic costs from the value of priced outputs after all future costs and values are discounted to the present time. A four percent discount rate is required by Forest Service Manual 1909.17, Economic and Social Analysis Handbook.

4. Priced Outputs

Priced outputs are those that are, or can be, given a dollar valuation. These outputs fall into two categories: market and nonmarket. Market value is the unit price of an output normally exchanged in a market.

Its value is what people are willing to pay as established by actual sales transactions. Nonmarket values, also referred to as assigned values, are the unit prices given to outputs which are not normally exchanged in a market. Comparable sales transaction data and other techniques for simulating value are used to establish a nonmarket price.

Priced outputs with market values include timber, firewood, livestock grazing, developed recreation, and commercial fish harvest. Priced outputs with nonmarket values include wildlife oriented recreation and other dispersed recreation.

Timber values are based on prices purchasers historically have paid for timber on this Forest. They vary by species and tree size. Firewood, special uses and mineral leases are also valued in terms of fees actually paid for these goods and services.

The nonmarket values for recreation, including hunting and fishing, are based upon the 1985 RPA Program. They are tailored to the Pacific Northwest Region and take into account different types of recreational activities available on the Forest and the quality of these activities.

Priced outputs do not include developed minerals. Mineral resources do occur on the Forest, but the extent is not proven. The magnitude and timing of future mineral development are speculative. Potential mineral benefits could vary between alternatives because different amounts of land are allocated to management strategies which restrict development.

5. Nonpriced Outputs

Nonpriced outputs are those for which there is no available market transaction evidence and no reasonable basis for estimating a dollar value. Examples of nonpriced outputs include protection of threatened and endangered species and cultural resources and providing natural scenery.

Although PNV is used to compare the net value of priced resources in the alternatives, nonpriced outputs and environmental quality are also taken into account. As indicated above, net public benefit includes both priced and nonpriced resource outputs.

Each alternative except Alternative NC meets MMRs for resource protection and productivity. These requirements, which often decrease PNV, are costs of meeting alternative resource objectives. Management objectives that exceed minimum legal requirements and reduce PNV are discretionary costs of meeting alternative objectives. The reductions in PNV must be compared with the ability of the alternative to address the Public Issues.

6. Economic Comparision and Tradeoffs Between Alternatives

This section discusses the economic consequences of alternatives. It begins with a comparison of variations in PNV among the alternatives. Net cash flows, costs, receipts, and noncash benefits are then examined. Finally, quantitative indicators of responsiveness of alternatives to Public Issue Groups are evaluated.

7. Present Net Value and Discounted Costs and Benefits of Alternatives

The proposed alternatives are ranked by decreasing PNV in Table II-27. The maximum PNV Benchmark is included for comparison. The figure displays the PNV and the total discounted costs and benefits of each alternative. Changes in PNV and total discounted costs and 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.

By comparing the PNVs on Table II-27 with the ASQs on Table II-12 it is evident that PNV generally decreases because ASQ decreases. Exceptions are Alternatives B and E, where timber benefits rise with accelerated departure harvest, but costs rise more to reduce PNV.

Table II-28 lists the approximate contribution of the timber, recreation, and range programs to the alternatives' PNVs. These are the primary components of the 150 year PNVs shown in the previous table. Direct comparisons of benefits and costs by individual resource groups provide broad indications of relationships, but these may be misleading because many costs of multiple-

use management are not separable. Once again, the alternatives are listed in order of descending PNV.

The "other" benefits listed in Table II-28 pertain to fish, water, and wildlife outputs to which monetary values have been assigned. This includes the value of fish caught commercially and the value of recreational experiences related to fish and wildlife. Appendix B, DEIS, provides details of unit costs and values.

Table II-28
Discounted Benefits And Costs By Resource Group
(Expressed in millions of dollars discounted to the present.)

ALT	DISCOUNTED BENEFITS				DISCOUNTED COSTS				
	Timber	Rec	Range	Other	Timber	Rec	Engin- eering	Range	Other
C	1596	2250	4	239	292	185	264	2	330
NC	1313	2300	3	231	250	186	160	1	252
D	1180	2430	3	232	208	188	195	1	280
A	1094	2431	3	231	185	188	181	1	252
E	1094	2438	3	237	183	188	181	1	275
G	1053	2438	2	237	169	188	162	1	269
B	1385	2250	3	239	237	185	216	1	304
F	834	2450	2	251	127	188	141	1	257
I	699	2477	2	269	105	189	121	1	268
H	316	2492	1	251	58	189	86	1	225

The value of benefits produced by recreational investments is estimated to be what visitors are willing to pay for their experiences. These values appear in the Forest Service document "Economic Analysis Revision of November 10, 1983, Regional Direction Package", April 27, 1984, and Appendix B of this DEIS.

a. Cost Analysis

The Forest's ID Team used a "zero-based budgeting" approach to determine the costs of each alternative. First, the fixed costs common to all alternatives were determined. Then variable costs specific to individual alternatives were estimated. The total of fixed and variable costs equals the total costs for each alternative.

b. Fixed Costs

Table II-29 displays the dollar amount, about \$5 Million per year, needed to protect (a) the health and safety of visitors using the Forest when it is managed in a custodial manner and (b) the productive capability of the Forest and adjacent lands. Management under this budget would be custodial; it would only pay for stewardship of the land.

Table II-27
PNV and Discounted Costs and Benefits
(Millions of dollars, discounted over the 150 year planning horizon.)
("Change" is measured relative to the next alternative.)

BENCHMARK OR ALTERNATIVE	PRESENT NET VALUE		DISCOUNTED COSTS		DISCOUNTED BENEFITS	
	PNV	Change	Costs	Change	Benefits	Change
Max PNV (Benchmark)	3042		990		4032	
Alt C	3015	- 27	1073	+ 83	4088	+ 56
Alt NC	2998	- 17	849	-224	3847	-241
Alt D	2972	- 26	872	+ 23	3844	- 3
Alt A (No Action)	2952	- 20	807	- 65	3759	- 85
Alt E (Preferred)	2944	- 8	828	+ 21	3772	+ 13
Alt G	2941	- 3	789	- 39	3730	- 42
Alt B (RPA)	2933	- 8	944	+155	3877	+147
Alt F	2822	-111	715	-229	3537	-340
Alt I	2762	- 60	684	- 31	3446	- 91
Alt H	2501	-261	559	-125	3060	-386

Table II-29

Costs For Minimum Level Management

COST CATEGORY	AVERAGE ANNUAL COST (Millions per Year)
Overhead (offices, computers, etc.)	\$1.527
Protection (fire, law, timber)	1.576
Engineering	0.550
Bull Run water quality	0.373
Recreation	0.236
Soils and other water quality	0.200
Fish and wildlife	0.130
Minerals	0.120
Range	0.010
TOTAL COSTS	\$4.722

c. Total Costs

Total costs are the sum of variable costs and the above minimum level costs. Total costs are shown in Table II-30. Variable costs have been separated into those which primarily pertain to the timber program, engineering, the recreation program and "other" programs. Costs of these other programs are disaggregated further in Table II-31.

Timber costs: They include Knutson-Vandenberg (KV) funds, brush disposal funds (BD), and support from other functions. This support amounts to about 10 percent of the total timber costs and includes timber sale consulting by experts on fish, wildlife, soil, water, fire, geology, recreation, visual, and cultural resources. They do not include costs of timber roads or engineering.

Engineering costs: They include the costs of timber roads.

Table II-30

Average Annual Costs By Alternative For The First Decade

(Expressed in Uninflated 1982 Dollars)

(Alternatives are Listed in Terms of Total Cost)

	VARIABLE COSTS				TOTAL COSTS		CHANGE FROM NC ALT
	Timber	Engineering	Recreation		Minimum Level	(\$MM)	
Alt				Other		(\$MM)	
C	13.6	12.2	3.0	9.7	4.7	43.2	+24%
B	11.0	10.1	3.0	8.5	4.7	37.3	+ 7%
NC	10.5	8.8	3.0	7.8	4.7	34.8	0
D	10.0	9.4	3.0	7.6	4.7	34.7	- 0.3%
E	9.0	8.4	3.0	7.4	4.7	32.5	- 7%
G	7.5	7.0	3.0	6.8	4.7	29.0	-17%
A	8.0	7.0	3.0	6.1	4.7	28.8	-17%
F	5.8	5.9	3.0	6.4	4.7	25.8	-26%
I	4.9	5.1	3.0	7.4	4.7	25.1	-28%
H	2.9	3.3	3.0	5.3	4.7	19.2	-45%

Recreation costs: Costs for recreation for all alternatives reflect the provision of a "standard" level of service. These costs are about 50 percent higher than what the Forest has received on average for the past 10 years. Under reduced funding levels, quality levels associated with this "standard" service cannot be provided.

Other costs: See Table II-31.

Table II-31

"Other" Variable Costs (Millions of Uninflated 1982 Dollars)

(Alternatives are Ranked in Terms of the Total Costs)

ALTERNATIVE	AVERAGE ANNUAL COSTS DURING THE FIRST DECADE				
	Monitoring & Variable Overhead	Fish and Wildlife	Soil and Water	Range	Total
C	7.7	1.0	0.9	0.07	9.67
B (RPA)	6.6	0.9	0.9	0.06	8.46
NC (No Change)	6.6	0.8	0.4	0.04	7.84
D	6.0	0.8	0.8	0.05	7.65
E (Preferred)	5.7	0.9	0.8	0.04	7.44
G	5.1	0.9	0.8	0.03	6.83
A (No Action)	4.9	0.8	0.4	0.04	6.14
F	4.1	1.5	0.8	0.03	6.43
I	3.8	2.4	1.2	0.03	7.43
H	2.7	1.5	1.1	0.02	5.32

Monitoring costs are approximately \$350,000 per year, exclusive of the Bull Run Watershed. "Variable overhead" describes costs which vary by the amount of work done and support multiple programs. Variable overhead would pay for work such as typing, computer processing, personnel management, geological support, and suppressing forest fires.

d. Cash and Benefit Flows

Cash receipts and budget costs measure actual flows to and from the U.S. Treasury. Market resource values which result in actual cash returns include timber, campground use, livestock grazing, and special use permits. Livestock grazing and campground use include actual cash receipts as well as noncash benefits.

Nonmarket resource values which are noncash benefits include dispersed recreation, wilderness, and wildlife-dependent recreation. The purpose of assigning dollar values to noncash benefits is to reflect a resource's total economic benefit even though none or only part of the total value is collected as cash receipts under current laws and regulations.

Net cash flows, cash receipts, and noncash benefits are displayed in Table II-32. Alternatives are ranked in terms of net receipts for the first decade. More than 99 percent of the total receipts are produced by timber harvest, so the ranking of net receipts generally parallels timber harvest.

All alternatives show positive flows to the U.S. Treasury during this period except Alternatives F, H, and I. Net receipts vary from \$12 to minus \$8 million. This variation is primarily due to changes in the volume, species mix, and size class of timber harvested in conjunction with the costs of harvesting the timber.

By the fifth decade, total costs usually decrease and non-cash benefits increase. The cost decreases are due to less expenditures to rehabilitate recreational facilities

Table II-32
Average Annual Cash Flows And Noncash Benefits
(Values expressed in millions of undiscounted, 1982 dollars)

ALT	DECADE 1				DECADE 5			
	Total Receipts	Total Costs	Net Receipts	Noncash Benefits	Total Receipts	Total Costs	Net Receipts	Noncash Benefits
MC	46	34	+12	27	46	34	+ 12	33
B	46	37	+ 9	27	40	34	+ 6	27
C	51	43	+ 8	27	40	35	+ 5	27
D	40	35	+ 5	28	34	28	+ 6	38
A	33	28	+ 5	27	33	26	+ 7	37
E	36	33	+ 3	28	33	28	+ 5	38
G	32	29	+ 3	28	32	27	+ 5	38
F	25	26	- 1	28	28	25	+ 3	38
I	21	25	- 4	28	25	24	+ 1	39
H	11	19	- 8	28	16	19	- 3	40

and, in the case of departures, less timber being sold. The increase in noncash benefits is due to increases in the number of recreationists visiting the forest.

8. Major Tradeoffs Among Alternatives

This section summarizes the relationship between economic values, effects on Forest-dependent communities, and responses by alternatives to Public Issues. Major economic and noneconomic tradeoffs within and between alternatives can be noted. A complete understanding of differences between alternatives requires reading all of this chapter and Chapter IV. Chapter I and Appendix A discuss Public Issues in greater detail.

To provide a context for assessing tradeoffs and socioeconomic conditions, the national, regional, and local relationships of the Forest are briefly summarized. The selected economic values and quantified indicators of responsiveness to major Public Issues are then shown. Finally, the incremental differences among the alternatives are discussed.

National, Regional and Local Overview

National (RPA) planning estimates that total demands will rise for all National Forest System outputs. At the same time, there is a strong demand to protect and enhance the quality of the environment. The Nation benefits when supplies are provided from the most efficient sources of production in an environmentally sound manner.

Currently about two-thirds of the Forest-related employment is recreation based, while the other one-third is accounted for in timber harvesting and manufacturing activities. The remainder was primarily Forest employees and contractors. Since 1980, the annual payments to counties has been about 10 million dollars, see Chapter III, Socioeconomic Section.

Nationally, this Forest usually ranks within the top five National Forests in terms of timber harvested. Most of the timber harvested on the Forest received primary processing in the local influence area; i.e., Multnomah, Hood River, Wasco, and Clackamas Counties.

The Forest has a diverse population of game and non-game wildlife species that provides a variety of wildlife-related recreation experiences, such as opportunities for hunting or viewing. In addition to game species, important nongame species, especially the spotted owl, affect Forest management activities.

Resident fisheries are found throughout the Forest. Forest streams are important contributors to total Columbia River Basin anadromous fish production. This has special significance to Indian tribes holding fishing rights. Several important anadromous fish runs are found in the Hood, Clackamas, Sandy, and Salmon Rivers. Approximately 40 percent of all Oregon residents, plus numerous industries, rely on this Forest's aquatic resources for their water. Congressional designation of the Columbia River Gorge as a National Scenic Area has recognized the Forest's preeminent role as a local, regional and national supplier of unique recreational experiences. The Forest is also located within a short driving distance from the city of Portland, Oregon. Increases in all types of recreation uses are expected. Wilderness and other semi-primitive recreational opportunities are projected to be in short supply.

The potential livestock grazing opportunities on the Forest are low. The Forest historically has been unimportant, nationally and regionally, as a source of livestock grazing, and this is not expected to change. Livestock grazing, however, is important to the few ranch operations that have existing permits on the Forest.

Economic Values and Responses to Major Public Issues

The major reason why alternatives differ is that each was designed to respond to Public Issues in a different way. Section D of this chapter summarizes many of those differences by using indicators of responsiveness to Public Issues. These indicators are described in Table II-33.

Differences and Similarities of Individual Alternatives

The indicators of responsiveness to the Public Issues for each alternative are presented in the Table II-34 in order of incremental decreases in PNV. The Maximum PNV Benchmark is included as a reference. This is one method of displaying the differences and similarities of the alternatives. The reader can compare any two alternatives in the same manner.

Table II-33
Indicators Of Responsiveness To The Public Issues

PUBLIC ISSUE GROUP	Indicators of Responsiveness	What The Indicator Measures
ISSUE GROUP 1: TIMBER	Average Annual Volume Offered (MMBF), First Decade: Allowable Sale Quantity, Green (ASQ) . . . Timber Sale Program Quantity (TSPQ) . . . Long-Term Sustained Yield Capacity (MMCF) . .	Green, merchantable volume offered (million board feet per year) Total projected volume offered (million board feet per year) The annual capacity of the Forest to produce green, merchantable volume 150 years after Forest Plan implementation (million cubic feet per year)
ISSUE GROUP 2: FISH AND WATER	Aquatic Habitat Stability Index (10 = highest) Acres Assigned to Meet Riparian Objectives. .	An index based on the Forest's capacity to provide aquatic habitat 20 years after Forest Plan implementation (index is based on a scale from 1 to 10) Amount of land in Management Areas A1 (Bull Run), A9 (Key Riparian), B6 (Special Watersheds), B7 (General Riparian)
ISSUE GROUP 3: WILDLIFE	Acres of Old Growth after 50 Years Acres of Young Growth after 50 Years	Total area supporting trees at least 200 years old, 50 years after Forest Plan implementation Total area supporting trees less than or equal to 20 years old, 50 years after Forest Plan implementation
ISSUE GROUP 4: RECREATION	Expected Visual Condition after 50 Years. . . Natural Appearing Viewsheds Viewsheds Appearing Slightly Altered. . . Dispersed, Non-Wilderness, Semi-Primitive Recreation Opportunities After 50 Years Motorized (M RVDs/year) Nonmotorized (M RVDs/year)	Appearance of the Forest's 48 most sensitive viewsheds, 50 years after Forest Plan implementation. Number of viewsheds less than 5% visually altered Number of viewsheds less than 10% visually altered Visitor days of semi-primitive motorized recreation, 50 years after implementation Visitor days of semi-primitive nonmotorized recreation, 50 years after plan implementation.
ISSUE GROUP 5: UNROADED AREAS	Areas Retaining Unroaded Characteristics After 15 Years. After 50 Years.	Of the 10 existing nonwilderness unroaded areas, How many will remain essentially unroaded 15 years after the Forest Plan is implemented. Of the 10 existing nonwilderness unroaded areas, how many will be in management areas that allow no roads
ISSUE GROUP 6: COMMUNITIES	Average Annual Payments to Counties (Millions) Change in Employment (Number of Jobs)	First decade average annual amount paid by the U.S. Treasury based on gross Forest receipts Relative change (from 1977-1986 base period) in Forest contributions to employment sources in the four county influence area

A narrative comparison of the alternatives in terms of incremental differences in PNV follows the table. The discussion identifies how each alternative's response to the ICOs reduces PNV. By comparing each alternative with the one that precedes it, the incremental tradeoffs between responses to Public Issues and PNV can be shown. Net public benefits can be evaluated based on an examination of these tradeoffs.

Alternative C

Alternative C has the highest PNV because its timber harvest would be the highest among the alternatives. Net receipts during the first decade, however, would rank third. Net receipts are returns to the Treasury which primarily include timber cash receipts less all costs of managing the Forest. The lower ranking occurs because less valuable trees would be harvested and activities would occur in more areas where logging and road construction costs are high. The required harvest levels for the first five decades would result in some scheduling choices that do not maximize economic returns. High levels of fish and wildlife habitat investment would also reduce net receipts. This alternative and Alternative B, which harvests the third highest amount of timber, provide the fewest noncash benefits in the second decade. Noncash benefits are values that Forest users receive but do not actually pay for.

The high level of timber harvest would stimulate the highest potential jobs, wages, and payments to counties during the first decade. Timber-related jobs and payments to counties are expected to decline in decades two through five as the Allowable Sale Quantity (ASQ) drops approximately seven percent per decade. The ASQ will equal the Long-Term Sustained Yield Capacity (LTSYC) in the fifth decade and thereafter.

All suitable acres, except for those reserved for Minimum Management Requirements (MMRs), are eventually harvested. Thus, the Bull Run and all 10 unroaded areas are harvested. This results in the lowest amount of old growth remaining after 50 years of the alternatives considered, and adversely affects wildlife species which are dependent on such habitat. Conversely, wildlife which favors the habitat provided by young growth should be positively affected. Alternative C provides more such habitat than does any alternative other than Alternative NC.

In 50 years Alternative C will provide the fewest (2) naturally appearing viewsheds, the fewest (0) semi-primitive motorized RVDs/year, and the fewest (3,000) semi-primitive nonmotorized RVDs/year as do Alternatives NC and B.

Although it explicitly manages the fewest number of acres for fish habitat and water quality purposes, the

Table II-34
Tradeoffs Between Economic Benefits And Responses To Issues
(NE indicates "Not Estimated")

Benchmark or Alt	ECONOMICS					TIMBER ISSUE			FISH AND WATER ISSUE		WILDLIFE ISSUE	
	(Millions of Dollars)					First Decade,		LTSYC	Decade 1-2 Stability Index	Riparian Emphasis Acres	Acres After 50 Yrs	
	PNV	Net Receipts Ave. Annual		Noncash Benefits Average Annual		Avg Annual MMBF					Old Growth	Young Growth
		Decade 1	Decade 2	Decade 1	Decade 2	ASQ, Green	TSPQ	(MMCF)				
Max PNV	3,042	NE	NE	NE	NE	287	363	565	NE	82,800	225,300	112,300
C	3,015	+ 8	+ 5	27	27	393	493	565	1.2	82,800	193,500	101,800
NC(No Change)	2,998	+12	+12	27	33	339	443	651	0.9	95,200	228,000	105,000
D	2,972	+ 5	+ 6	28	38	287	385	456	2.7	191,800	249,900	87,800
A(No Action)	2,952	+ 5	+ 7	27	37	229	316	469	3.3	166,300	276,100	68,400
E(Pref.)	2,944	+ 3	+ 5	28	38	255	347	438	3.5	203,700	264,300	67,400
G	2,941	+ 3	+ 5	28	38	222	307	438	3.8	203,700	273,100	73,300
B (RPA)	2,932	+ 9	+ 6	27	27	335	444	514	1.3	166,300	216,200	85,200
F	2,822	- 1	+ 3	28	38	166	239	399	8.0	255,100	315,900	60,200
I	2,762	- 4	+ 1	28	39	136	202	340	9.2	284,800	342,400	62,600
H	2,501	- 8	- 3	28	40	62	108	209	7.9	200,800	409,300	36,000

Benchmark or Alt	RECREATION ISSUE				UNROADED ISSUE		COMMUNITIES ISSUE	
	(After Fifty Years)				Areas Unroaded		1st Decade Ave. Annual	
	Viewshed Appearance		Supply of Dispersed Semi-Primitive RVD's		After 15 Years	After 50 Years	Payments to Counties (Million \$)	Changes in Jobs
	Nat- ural	Slight Altered	Motorized	Non- Motorized				
Max PNV	5	2	0	3,000	1	0	9.3	+ 700
C	5	2	0	3,000	1	0	12.7	+2,700
NC(No Change)	10	2	8,000	61,000	4	4	11.4	+1,700
D	11	9	8,000	54,000	3.5	3.5	9.9	+ 800
A (No Action)	12	4	7,000	59,000	7	4	8.1	- 300
E (Pref.)	17	14	9,000	75,000	4	4	8.9	+ 200
G	17	14	9,000	75,000	6	4	7.9	- 500
B (RPA)	5	2	0	3,000	1	0	11.4	+1,800
F	24	22	13,000	105,000	5	3.5	6.2	-1,700
I	30	17	20,000	157,000	10	10	5.2	-2,300
H	38	6	28,000	206,000	10	10	2.8	-3,900

habitat/quality index for this alternative is higher than Alternative NC. This is because Alternative C has MMRs, whereas Alternative NC does not.

There would be no rivers recommended for Wild and Scenic River classification, nor would any new areas be recommended as Special Interest Areas (SIAs) or as Research Natural Areas (RNAs).

Alternative NC (No Change)

This alternative has a PNV which is less than 1 percent lower than Alternative C's, but its first decade net receipts are 50 percent higher. This is primarily because Alternative NC harvests less timber, but its unit costs are also less.

This is the only alternative which has a 753,000 acre land base, as compared to the 647,000 acre tentatively suitable land base for the other alternatives. The "tentatively suitable" land base is that which, before considerations for MMRs, can legally be considered for timber management. In addition to starting with a land base which is 106,000 acres larger, this is the only alternative which does not subsequently reduce its land base to account for MMRs.

Compared to Alternative C, this alternative manages 15 percent more acres for fish habitat and water quality purposes. This is because the Bull Run Watershed will continue to be managed under existing direction in Alternative NC. However, because this alternative does not meet riparian MMRs, its fish habitat and water quality

stability index is the lowest of the alternatives considered. Alternative C has the second lowest index value. In 50 years there will be 17 percent more old growth under Alternative NC than under Alternative C.

The first decade ASQ of Alternative NC is 14 percent less than Alternative C's. Ten percent less revenues will be paid to the counties and 1,000 fewer jobs will exist.

Alternative NC maintains the unroaded characteristics of four areas for at least 50 years; Alternative C does not leave any such areas unroaded for this period of time. This is the main reason why Alternative NC provides 8,000 more motorized, semi-primitive RVDs/year in the year 2030. Alternative NC also provides 58,000 more nonmotorized, semi-primitive RVDs during the year 2030 than does Alternative C.

Alternative NC recommends the Roaring and Salmon Rivers for classification as Wild and Scenic, provides for all existing SIAs and RNAs, and adds five SIAs and two RNAs. Alternative C does not recommend any rivers nor makes proposals for SIAs or RNAs.

Alternative D

There is less than one percent difference between the PNVs of Alternatives D and NC. Alternative D's first decade net receipts are about 58 percent less, payments to counties during the first decade are 13 percent less, but there are 900 more jobs. The first decade ASQ is 15 percent less. The main reason why these decreases in timber-related indicators do not significantly affect PNV is because a larger component of PNV, that related to nontimber benefits, is essentially the same for both alternatives.

Compared to Alternative NC, about twice as many acres are explicitly managed to meet fish habitat and water quality objectives, and the index is three times better. After 50 years there will be about 7 percent less old growth and 16 percent more young growth.

Fifty years hence there will be one additional naturally appearing viewshed and 7,000 less nonmotorized, semi-primitive RVDs, although the same number of semi-primitive motorized RVDs. Unroaded areas will be managed in about the same way as under Alternative NC.

Alternatives D and NC both recommend two rivers for classification under the Wild and Scenic River System. Both alternatives retain existing SIAs and RNAs. Alternative D provides for five more additional SIAs than does Alternative NC. Alternative D does not recommend adding additional RNAs.

Alternative A (No Action)

There is less than a one percent difference between the PNV of this alternative and that of Alternative D. Net receipts and noncash benefits are essentially the same.

During the first decade, Alternative A's ASQ is 20 percent less, payments to counties are 18 percent less, and there are 1,100 fewer jobs.

About 13 percent fewer acres are explicitly managed for fish habitat and water quality purposes but, because there are fewer impacts of timber harvesting, the corresponding quality index is 22 percent higher. After 50 years there will be ten percent more old growth and 23 percent less young growth. There will be one additional naturally appearing viewshed. The number and type of semi-primitive RVDs supplied will change little.

After the first 15 years, Alternative A retains twice as many unroaded areas. However, after 50 years, Alternative A leaves 4 areas undeveloped whereas Alternative D leaves 3.5 of such areas undeveloped.

Alternatives D and A both recommend two rivers for classification under the Wild and Scenic River System. Alternative D provides for five more SIAs than does Alternative A. Alternative A provides for two additional RNAs, Alternative D does not recommend adding additional RNAs.

Alternative E (Preferred)

This alternative's PNV is essentially the same as that of Alternative A. This alternative's ASQ is 11 percent higher during the first decade. However, since this alternative departs from nondeclining flow, and Alternative A does not, the difference between their ASQs drops to 7 percent by the fifth decade. Despite the first decade increased ASQ of this alternative, its first decade net receipts are 40 percent less than Alternative A's. This is primarily the result of increased costs associated with developing 3 unroaded areas for timber production during the first 15 years. However, since these areas are developed after the 15th year in Alternative A, the non-cash benefits provided by both alternatives are about the same.

The increase in harvest levels causes a similar increase in payments to counties and results in 500 more jobs during the first decade.

In 50 years, compared to Alternative A, this alternative will provide 16,000 more nonmotorized, semi-primitive and 2,000 more motorized, semi-primitive RVDs per year. Alternative E will also result in 5 additional naturally appearing viewsheds and 10 additional slightly altered viewsheds.

About 22 percent more acres will be explicitly managed for fish habitat and water quality purposes. This will result in a slight increase in the habitat/quality index from 3.3 to 3.5. In 50 years, Alternative E will provide 4 percent less old growth but about the same amount of young growth.

Alternatives A and E both maintain existing SIAs and RNAs and propose adding additional areas. Compared to Alternative A, this alternative provides for 6 more SIAs and one more RNA. Both alternatives recommend adding the Roaring and Salmon Rivers for classification under the Wild and Scenic River System. Alternative E recommends adding one additional river, the Clackamas, for classification.

Alternative G

Alternatives E and G have the same management area designations. So, they have the same SIAs and RNAs, and they recommend the same rivers for classification under the Wild and Scenic River System. After 50 years both alternatives will provide the same number of naturally appearing viewsheds and semi-primitive RVDs.

The two alternatives have essentially the same PNV, net receipts, and noncash benefits. This is due to offsetting factors: Alternative E returns more gross receipts, but it costs more, primarily for mitigation of potentially adverse effects of harvests on water quality and fish and wildlife habitat.

The difference in the two alternatives relates to the fact that Alternative E is a departure from nondeclining timber flow and Alternative G is not. In the first decade there is a 13 percent difference in ASQ, 11 percent difference in payments to counties, and about 700 fewer jobs related to timber harvesting on the Forest. These differences become progressively smaller during decades two through four. By the fifth decade both alternatives have the same ASQ, which is equal to their LTSYC.

Alternative G has a slightly higher fish habitat and water quality index. After 50 years there will be 3 percent more old growth, and 9 percent more young growth. In contrast to Alternative E, Alternative G defers harvesting in all of the Twin Lakes unroaded area and half of the Larch and Wind Creek unroaded areas for 15 years.

Since Alternative G's ASQ is less than E's, and since both alternatives have the same land base, there is a greater probability of producing timber without incurring unacceptable environmental consequences at Alternative G's level of harvest.

Alternative B (RPA)

This alternative allocates all tentatively suitable areas, except for the Bull Run drainage, to intensive timber management. In so doing, it affords no special management to any of the Special Interest Areas or Research Natural Areas so managed under Alternative G. It also recommends that no rivers be classified under the Wild and Scenic River System, and it leaves none of the 10 unroaded areas in their present condition. In the first decade this results in a 51 percent increase over the ASQ of Alternative G, a 44 percent increase in pay-

ments to counties, about 2,300 more jobs, and three times as many net receipts. However, the PNV's of the two alternatives are essentially the same. This is because Alternative B costs substantially more, and because some of the additional volume of timber harvested is of lesser net value per acre than the average value of the timber harvested under Alternative G.

Alternative B's harvest schedule departs from nondeclining flow. This causes timber-related jobs and payments to counties to decline with timber harvest levels, about 5 percent per decade from decade one through decade 5. The ASQ will equal the LTSYC in the fifth decade and thereafter. This will result in a relatively constant effect on payments and jobs after the fifth decade.

The fish habitat and water quality index drops by 66 percent primarily because about 19 percent less acres are explicitly managed to meet fish habitat and water quality purposes. In 50 years there will be 20 percent less old growth and 16 percent more young growth.

The two alternatives differ greatly in the types of recreation opportunities which will be supplied. In 50 years, Alternative B will provide 12 fewer naturally appearing and 12 fewer slightly altered viewsheds, no motorized, semi-primitive RVDs, and 96 percent fewer non-motorized, semi-primitive RVDs. This results in a 29 percent decrease, relative to Alternative G, in the non-cash benefits during the fifth decade. Alternative B defers harvesting in 5 fewer unroaded areas and eventually harvests 4 additional unroaded areas.

Alternative F

Alternative F has a PNV which is four percent lower than Alternative B's. This is due to much larger, though offsetting, differences in the cash and non-cash aspects of the two alternatives. From a cash standpoint, during the first decade, Alternative F realizes a negative \$1 million in annual net receipts (costs are larger than receipts), while Alternative B returns a positive \$9 million per year. The 45 percent difference in payments to counties and difference of 3,500 jobs during the first decade relates to the 50% difference in the two alternatives' first decade ASQ's. While Alternative B's first decade timber harvest level is above its LTSYC, Alternative F's is below its LTSYC.

From a noncash standpoint, the value of such benefits is 41 percent higher during the second decade under Alternative F. This reflects the following differences between Alternatives B and F: fish habitat and water quality acres increase 53 percent under Alternative F, and the corresponding stability index increases six-fold. The number of naturally appearing viewsheds in 50 years will be nearly five times greater, there will be eleven times the amount of slightly altered viewsheds. After 50 years, Alternative F will provide 13,000 more motorized and

102,000 more nonmotorized, semi-primitive RVDs/year. Under Alternative F, five times as many unroaded areas will remain as such after 15 years.

The 22 percent reduction between the two alternatives in LTSYC, in part, reflects a 46 percent increase in wildlife habitat.

In contrast to Alternative B, Alternative F will do the following: all existing Special Interest Areas (SIAs) and Research Natural Areas (RNAs) will be retained. Seven additional areas will be managed as SIAs, and three additional areas will be managed as RNAs. Two rivers will be recommended for classification under the Wild and Scenic River System.

Alternative I

The PNV of Alternative I is two percent less than the PNV of Alternative F. During the first decade, Alternative I returns four times fewer net receipts and about the same noncash benefits.

The first decade ASQ of Alternative I, compared to Alternative F, is 18 percent less and payments to counties are 16 percent less. There are 600 fewer jobs provided under Alternative I. First decade harvest levels of both Alternatives F and I are below their respective LTSYCs.

Alternative I manages 12 percent more acres than does Alternative F for fish habitat and water quality purposes and results in a corresponding increase in the associated stability index. After 50 years, Alternative I will provide eight percent more old growth and the same amount of young growth. It retains about three times as many unroaded areas in their current state after 50 years.

From a recreation standpoint, after fifty years, there will be six more natural and five fewer slightly altered appearing viewsheds, 7,000 more motorized, semi-primitive RVDs/year, and 52,000 more nonmotorized, semi-primitive RVDs/year.

Alternatives I and F both maintain existing SIAs and RNAs. Alternative I proposes thirteen additional areas, six more than Alternative F. Both alternatives provide for three additional RNAs. Alternative I recommends four rivers for classification under the Wild and Scenic River Systems, two more than Alternative F.

Alternative H

With a PNV 9 percent lower than Alternative I's, this alternative provides two times fewer net first decade receipts but about the same noncash benefits. The difference in receipts is a function of a 54 percent lower ASQ. Alternative H's first decade harvest level is below its LTSYC. Payments to counties are 46 percent less than in Alternative I, and there are 1,600 fewer jobs.

By being the only alternative to preclude harvesting in all existing old growth, 20 percent more old growth is provided in 50 years (12 percent less young growth). About 29 percent fewer acres are explicitly managed to meet fish habitat and water quality objectives, resulting in a 14 percent decrease in the associated quality index.

Twenty eight of the Forest's most sensitive viewsheds will be naturally appearing in 50 years, as compared to the 30 in Alternative I. Forty percent more motorized, semi-primitive RVDs and 31 percent more non-motorized, semi-primitive RVDs will be supplied 50 years from now. As is the case with Alternative I, all ten unroaded areas will remain such throughout the 150 year planning horizon.

Alternative H recommends two rivers for classification in the Wild and Scenic River System (Alternative I recommends four). Both alternatives recommend maintaining all existing SIAs and RNAs. Alternative H provides for four new SIAs, whereas Alternative I provides for 13 additional ones. Both alternatives call for adding three new RNAs.

CHAPTER 3



Chapter III - Affected Environment

A. Introduction

Chapter III describes the Forest. It deals with the environment that will be affected by the management activities in each alternative. This environment contains a variety of physical, biological, and human components and is therefore quite complex.

This chapter is divided into two sections. Section A describes each element of the natural environment. It includes the geology, the plants, and the animals found on the Forest. The primary emphasis is on the Forest as it is, without human intervention. Section B emphasizes human concerns. Of necessity, the description of each element includes aspects of present management.

For convenience, the two sections are divided into parts, each discussing a different aspect of the Forest. In each part, the current situation and management, significance to the natural environment and the human community, and interactions with other resources and uses are discussed. In reality, however, it is not always so clear-cut and easy to separate the different elements from each other.

Chapter II discussed the alternatives. Chapter III describes the environment the alternatives will affect. Chapter IV will discuss, in detail, how the alternatives will impact the environment.

B. Physical and Biological Environment

1. Geologic Setting

a. Background: Geological Processes

The normal way to see the Forest is from the ground up. Giant, centuries-old trees stand watch. Alpine lakes sparkle under the sun. Snow blankets endless slopes. Water cascades over rock cliffs or flows toward the Pacific. But the surface is not the complete Forest. To see the Forest as it really exists, to see both its strengths and its fragilities, one must look beneath the surface to see the geologic origins which make the Forest what it is today.

Peaks, cliffs, and slopes give the Forest many of its most appealing features. It sits astride the Cascade Mountains, the major mountain range of the Pacific Northwest. Powerful earth movements, in never-ending geologic processes, formed the Cascades by pushing up the bedrock underlying

the earth's surface. As this went on, red hot lava poured through volcanic openings.

Through times immemorial, the bedrock has uplifted and folded. Where these irresistible forces were too powerful for the rock to hold, it fractured along lines to form geologic structures called faults. Since faults are geologically weaker than other surface structures, lava and water typically follow fault lines. The Clackamas River flows in direct correlation with major fault lines now existing on the Forest. The volcanic peak of Mt. Hood also correlates with a major fault line.

As geologic processes build up, they also tear down. In some places on the Forest, these processes work invisibly building up mountains. In other places, weathering and erosion chew away at mountains, and gravity transports the resulting rubble to locations below. A basic characteristic of erosion is the movement of weathered rock materials from one place to another in movements sometimes so gradual they are imperceptible. Other movements of materials can be sudden and violent. Few phenomena are more violent than landslides and floods. As this suggests, the important agents of erosion are water, ice, and mass wasting.

Erosion by water can result in geologic spectacles human beings find extremely beautiful. Columbia Gorge is a classic example. Two powerful geologic forces combined to create this magnificent structure. The first force was a series of enormous floods occurring over centuries. The second was a simultaneous and gradual uplifting of surrounding landforms. Erosion by glaciers -- large masses of flowing ice -- produce different effects than those caused by flowing water. Streams and rivers cut narrow, V-shaped valleys. Glaciers carve out wide U-shaped valleys. Both types of valleys can be seen along the Clackamas River drainage. In higher elevations, the river flows through an ancient glacial valley known as Big Bottom. As the water continues along its downward course, it leaves behind the glacial U-shaped valley and enters the lower elevation's V-shaped valley.

Neither ice nor flowing water is involved in another form of erosion, mass wasting. The driving force of mass wasting, or landslides, is gravity. Landslides occur regularly and naturally in mountainous terrain like that found on the Forest as one of Nature's means of moving soil and rocks from upper levels to bottom lands and stream channels. However, these movements can also be accelerated or magnified by human activities. Mass wasting is therefore an important consideration in the development of the Forest's management programs.

b. Existing Situation: Natural Features

The geological processes which formed the Forest created an unusual assemblage of peaks, slopes, valleys, and waters. At the Columbia River, the Forest is only 65 feet above ocean level. From that level, the land climbs steadily toward Mt. Hood until it soars more than two miles skyward. At 11,235 feet high, this peak is the tallest point in Oregon and one of the tallest points in the Northwest. Westward from Mt. Hood, areas bordering the Willamette Valley consist of gentle, tree-covered slopes. From these slopes, the terrain grows ever more rugged as it rises toward the Cascade crest. At higher elevations in the central areas of the Forest, high volcanic peaks and cones overlook glaciated valleys and rolling terrain. East of the Cascade crest, the terrain slopes more gently as the elevation falls toward the drier, desert-like areas of central Oregon.

c. Management Concerns: Earthquakes and Landslides

For all practical purposes, earthquakes are not a major hazard on the Forest. Volcanic activity in and around the Forest, in spite of the recent volcanic activity at Mt. St. Helens, has been comparatively insignificant for more than 200 years. Volcanic eruptions to some degree are always a possibility, but there are no present signs that such activity is resuming. Crandell (1980) investigated the scope and magnitude of a potential eruption on Mt. Hood in detail,

and presented his findings in U.S. Geological Survey Bulletin Paper No. 1492.

Landslides are a more serious matter; in some areas the risks are high. The accompanying diagram, Figure III-1, shows combinations of conditions which create a high risk of land instability.

Landslides take place with different types of movement:

Debris Slides. In these slides, shallow soil and rock debris move rapidly from higher to lower areas.

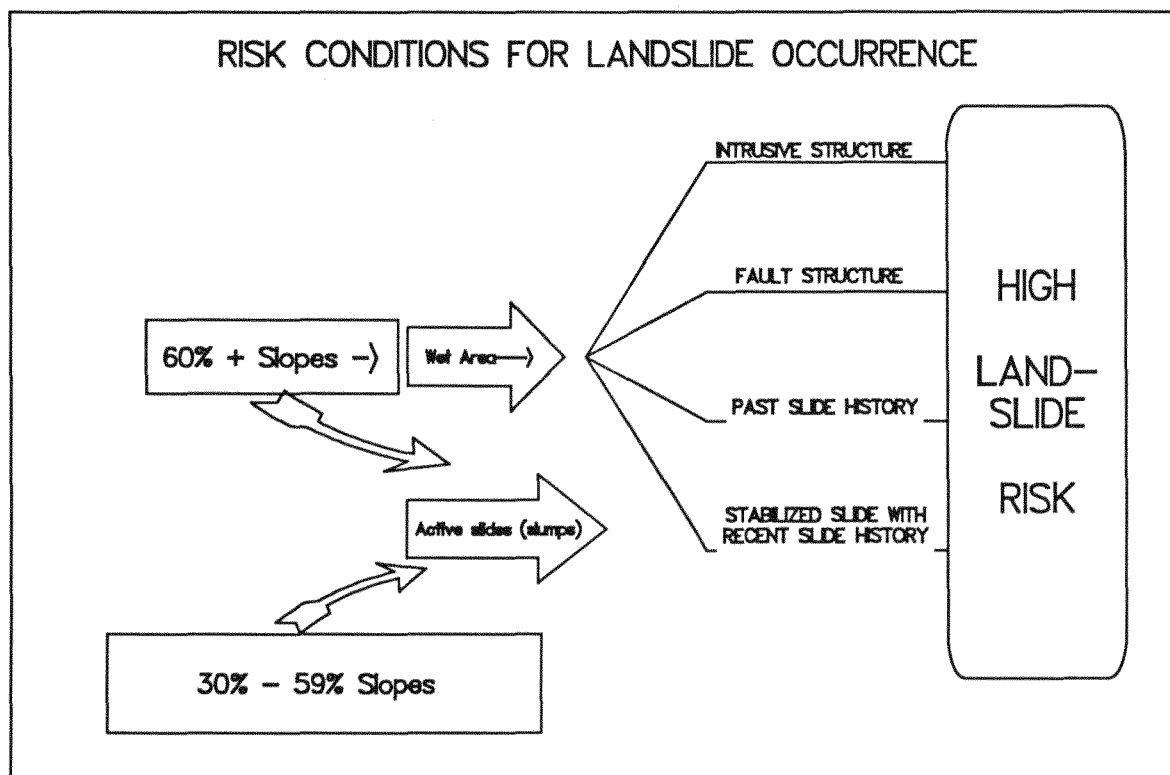
Slumps. These failures are comparatively slower and more deep-seated resulting in slow to moderate rates of movement.

Earth Flows. These can occur on gentle to moderate slopes, with moderate to imperceptible rates of movement. Also, they are generally greater than 100 feet deep.

Many activities which accompany human uses of the Forest's resources can increase the risk of destructive landslides. Disturbing the soils or vegetation in sensitive areas is a risk factor. Timber harvesting involving road building or similar soil-disturbing actions is another. Because landslides can cause the loss of capital investments, facilities, and the loss or degradation of natural resources, the impact of various programs on each type of land movement is a basic management concern.

(1) *Debris Slides.* Field reviews and inventories have identified areas with a high risk of debris slides. Timber harvesting and road building in such areas would increase the

Figure III-1



danger of landslides. Since the early 1970's, forest planning has emphasized more strategic road locations and encouraged the building of retaining walls and drainage structures. The number and seriousness of debris slides have been reduced significantly.

(2) *Slumps*. These are generally associated with debris slides or earth flows. They are therefore treated accordingly. A slump that is independent of another landslide will be treated based on such characteristics as size, composition, and rate of movement.

(3) *Earth Flows*. Inventories have identified 53,000 acres of active and stabilized earth-flow areas on the Forest. Of the total acreage, 18,900 acres of active earth flow are suitable for timber harvest. The Clackamas, Collawash, Oak Grove Fork, Hot Springs Fork, and Fish Creek watersheds contain deep seated, slow-moving earth flows. Some of these earth flow areas can cover thousands of acres.

Map III-1 Shows The Locations Of Earth Flows On The Forest (page III-105).

Current evidence shows that slope stability correlates with water content. Not surprisingly, the steeper the slope and the more water it contains, the higher the risk of instability. Since the removal of forest cover can increase the soil's water content, it follows that removing forest cover can increase the danger of earth movements. Activities on small parts of an earth flow affect not only the immediate area, but also the whole earth flow as an entirety. In the past, project planning and assessments have often been based on site-specifics instead of area-wide planning and a uniform management policy. To cope with possible cumulative effects of different projects on an earth flow, special management practices must be followed to reduce or eliminate the danger of reactivation or acceleration of destructive soil movements.

d. Geologic Features and Hazards in Relation to the Natural Environment

Many scenic attractions of the Forest are the consequence of eons-old geologic processes. The basalt cliffs of the Columbia Gorge and the Clackamas River drainage are spectacular natural features. Little Crater Lake is a unique geological structure set aside as a Special Interest Area. Two other geologic areas of high interest are Bagby Hot Springs and Parkdale Lava Beds. Both of these areas have been considered for designation as Special Interest Areas.

Soil composition and productivity are directly related to the weathering of bedrock material at the site, or the deposit of material produced by erosion. Parent bedrock determines to a great degree the mineral and physical content of the Forest's soils.

Aquatic resources, including fish, reflect past and present geologic processes. Landslides are a major cause of sedi-

ment deposits in the Forest's streams. Sediment can adversely affect fish in the short term, but sediment gravels can be a source of spawning gravels for anadromous fish in the long term. (A section of this chapter entitled Fish provides additional information.)

Timber is another natural resource adversely affected by active landslides. Timber and timber-producing lands can be lost when slides occur, and trees which manage to grow on slow moving earth flows are often twisted and jackstrawed. Geologic forms that affect wildlife include talus slopes, caves, rims, and ledges. Such geologic structures provide habitats for wildlife species like bats, swallows, and similar wildlife.

Mineral and rock resources found on the Forest are primarily used in timber activities. Some high quality rock for road construction is located in west side drainages; other minerals and rock are located in bedrock and surface deposits. The highest potentially leasable mineral resource is geothermal energy. Known Geothermal Resource Areas (KGRA) have been identified on the Forest by the U.S. Geological Survey. Locations include Mt. Hood, the Cary/Austin Hot Springs, and Brietenbush. More detailed information is provided in the section of this chapter entitled Minerals and Energy Management.

Geologic hazards on the Forest include floods, landslides, and rock falls. As mentioned earlier, volcanic eruptions and earthquakes appear to be minor threats. However, landslides can be catastrophic as in the Pollalie Creek debris flow in 1982. This flow destroyed a campground and killed one person. Other geologic hazards can be triggered by sudden or extreme changes in the environment, such as unusually high rains or blizzards. Rock falls are common hazards on some forest roads under freeze-thaw weather conditions. Other hazards can be affected by management programs. Some rockfall and landslide hazards have been reduced by installing barriers and chain-link blankets in high risk areas. A basic management concern is finding ways to modify, restrain, or prohibit any activity that could increase geologic hazards.

2. Climate

a. Existing Climatic Conditions

The Cascade Mountains divide the climate of the Forest into two different patterns. On the west side of the mountains, the climate is wet, maritime, and mild. On the east side, by comparison, it is dry, continental, colder in winter, hotter in summer. These climatic differences are due to the mountains acting as a barrier to winds prevailing from the west. As winds carrying water vapor from the Pacific Ocean cross the coastal range and reach the Cascades, they drop most of their moisture on their way to the mountain's crest. Relatively little moisture is left by the time the winds cross the barrier. Most of the Forest's precipitation

falls in the winter, usually in the form of snow above 3,000 feet. Rain is more common at lower elevations on the west side.

b. Relationships to the Natural Environment

Climate and elevation have the greatest impact on the species and quantities of vegetation. Climate also helps to determine the location and flow of water, the moisture content of the Forest's soils, and the nature of many other natural resources.

Trees, other plants, and wildlife adapt their location and behavior in response to changes in temperature, rainfall, and the availability of nutrition. Some species of wildlife migrate to higher elevations in warm weather, and return to lower levels in winter. Each species has distinctive requirements for food, water, and shelter. Similarly, differences in soils, moisture, and temperature determine the types of trees and other plants available to provide shelter and forage for herbivorous animals.

c. Relationship to the Human Environment

Most human activity, whether work or recreation, occurs on the Forest in the summer when the weather is usually warm, dry, and pleasant. However, the relative lack of snowfall at lower elevations on the west side makes it possible to use the Forest all year around. Many people hike or go sightseeing at lower elevations in the winter. Logging or other outdoor work is also possible. At higher elevations in the winter, snow sports are popular. A major climate-related concern on the Forest is the increased risk of fire when hot, dry weather lingers in the summer. Times of high risk of fire may require the restriction of human activities.

3. Soil Resources

a. Background

Five factors interact with each other to determine the quality of soil in different forest locations. The first factor is the parent material -- what kinds of rocks gave birth to the soil? Other soil determinants are climate, topographic features, the type of vegetation grown in the soil, and how long the environmental variables have acted on the parent material.

Differences in the Forest's climate have produced three fairly well-defined Forest zones. Ponderosa pine forests predominate the drier east side. Western hemlock forests are dominant on lower elevations of the mild, wet, west side. True fir and mountain hemlock predominate the cold, higher elevations. The upper layers of soil in each of these vegetative zones demonstrate how climate and vegetation interact in developing soil quality. The types of parent material beneath the surface layers of soil are relatively uniform, volcanic rock; yet the Forest supports a

diverse plant kingdom. Characteristics transmitted from parent materials to Forest soils are strongest where the soil is deepest.

b. Existing Soil Conditions

The major types of soil on the Forest were identified and defined in a inch-to-the-mile soil survey completed in 1979. This survey described 149 soil map units considered to respond differently to timber harvesting and road construction. The greatest use of a small scale survey is in overall planning, such as developing the Forest Plan. Efficient planning of individual projects requires site-specific soil information. At this time, less than five percent of the Forest has been surveyed intensively. However, present management direction has identified the need for accurate soil information in the execution of the Forest's programs. The highest priority for intensive soil surveys has been assigned to domestic watersheds.

Soils within the Western Cascade Province on the west side of the Forest tend to have the highest fertility levels, but they also possess the highest erosion and compaction hazards. These soils developed in material weathered from the older, volcanic, pyroclastic flows and breccias. The accumulation of organic matter and a well developed structure typify surface soil horizons. Weathering of the pyroclastic parent material has produced moderate to high clay contents in subsurface soil layers.

Soil types occurring at higher elevations along the Cascade Crest developed out of younger Cascades andesite rocks. Weakly developed structure and poorly expressed soil horizons are typical. Soil textures are normally moderately-coarse to moderate. Soil textures are determined by the relative proportions of various size groups of individual soil grains in the soil mass. The term specifically refers to the proportions of clay, silt and sand particles below 2-mm diameter.

Fertility levels in higher elevation soils are low, especially on sites dominated by Pacific rhododendron. Erosion and compaction hazards for these soils are moderate. Valleys in some high elevations in this region of the Forest experienced relatively recent glaciation. Soils are generally deep and well drained heterogeneous mixtures of soil and rock.

Wind-deposited material mantles the parent rock of soils east of the Cascade Crest. The northeastern section of the Forest has the deepest surface deposits. In the southeastern areas, deposits of glacial till dominate the soil landscape, and surface deposits are thinner. On these sites, sand and silt-sized particles dominate the wind-deposited surface layers. For all soil types east of the Cascade Crest, the erosion hazard is moderate to high, and the compaction hazard is moderate.

(1) *Soil Productivity.* The productivity, or site quality, of a parcel of land is determined by the way the soil and other environmental factors affect each other. Key environmental elements are precipitation, aspect (slope orientation), and air/soil temperatures. Because soil temperature and biological activity go hand in hand, soil temperature vitally influences overall soil productivity. Factors that define the moisture-holding capacity and nutrient qualities of soil, and therefore determine its productivity include:

- Effective soil depth. This is the difference between total rooting depth and volume of rock in the profile.
- Depth of the A horizon. This is a mineral soil layer characterized by accumulated organic material.
- Clay content in the soil layers below the A horizon.

(2) *Soil Moisture.* Since precipitation is comparatively low on the east side of the Forest, soil moisture retention exerts an unusually high influence on site productivity. Effective soil depth and texture also largely determine the moisture available to support plant growth.

(3) *Nitrogen.* This is an essential element in soil productivity. Nitrogen available for plant use is closely related to the soil's organic content, and the rate at which decomposition of organic matter releases it. Its availability is generally accepted as a limiting factor of Douglas-fir growth in the western interior portion of its geographical range.

West of the Cascades, soil productivity is highest in pyroclastic soils at lower elevations with high accumulations of organic matter in surface layers. In these soils, nitrogen levels in surface layers, measured through a simple, indirect index of the carbon-to-nitrogen ratio, range from .1 percent to .25 percent. Soils on the west side formed in the younger andesite and glacial till soils often contain less than .1% nitrogen in the surface horizons.

East of the Cascades, nitrogen levels become less important to productivity as soil moisture and rainfall decreases down to the pine/oak type of vegetation. Above 3,500 feet, timber productivity declines as cooler soil temperatures reduce the rates of nitrogen mineralization of the surface organic layer. Conservation of nitrogen reserves located in the surface organic layer becomes more important as elevations increase.

(4) *Compaction.* Soil productivity can be seriously reduced by timber harvesting activities which alter surface soil qualities. One of the most critical results of timber harvesting is soil compaction.

All soils can be compacted given sufficient impact and moisture, but those with moderate textures are most susceptible. Another important factor in soil susceptibility to compaction is soil moisture. Approximately 420,707 acres on the Forest are classed as moderate or severe in susceptibility to compaction. A more significant calculation is

the current estimate that about 30,000 acres have suffered compaction to some degree due to past harvests.

Soils are compacted when they are subjected to the movement or dragging of heavy objects across their surface. Tractor ground skidding and machine piling of slash are typical examples of compactive forces. Under these pressures, soil bulk densities increase within the skid trail system and adjacent to piled slash. The soil structure breaks down. Soil particles pack together and large pore spaces shrink. Infiltration rates decline and soil strength increases. Higher soil strengths restrict small root penetration within the soil medium. Ultimately this leads to reduction of moisture and nutrient uptake by conifer seedling root systems.

Information gathered over five years discloses that tractor operations are more common on the east side than on the west side of the Forest. One reason for this is that eastern districts have more terrain on slopes less than 30 percent. Forest slope inventories indicate that 72 percent of the land in Barlow, Bear Springs, and Hood River Districts has slopes less than 30 percent. During the period monitored, 70 percent of east-side districts were tractor-yarded, compared to 27 percent for west-side districts. The average acreage tractor-harvested over the five years was 1,170 for the west, and 1,470 for the east.

Compaction due to skidding operations varied from 3 percent to 30 percent of the harvest area in units on the west side. The lower compaction levels were obtained by using low ground pressure, torsion-mounted suspension equipment. Compaction caused by ground skidding on the east side varied from 9 percent to 30 percent.

Machine piling of slash is often used on tractor-yarded harvest units because it is more economical and less damaging to air quality than broadcast burning. On the west side of the Forest, 30 percent of regeneration harvest acres are customarily machine piled. On the east side, 50 percent are machine piled. Forest-wide, about 70 percent of shelterwood acres are treated with ground machinery. In harvest units employing both ground skidding and machine piling, compaction ranged from 14 percent to 36 percent on the west side, and from 10 percent to 47 percent on the east side. Although little field data are available to measure compaction caused by machine piling, preliminary information indicates that additional compaction is about 8 percent to 9 percent. Several factors, including the equipment used, soil types, moisture characteristics, amount of residual fuels left after logging, and contract specifications, help to explain variations in monitoring results.

Past monitoring indicates wide differences in the extent of compaction as a factor of timber sales. The data are best viewed with reference to the east-west differences in physical environments, especially their differences in soil moisture. To date no site-specific data have been collected to

aid in measuring the effects of compaction on tree height growth, or plantation volume reductions.

(5) *Fire*. The impact of fire on soil productivity depends in large part on the quantity of the surface organic mat consumed, and the intensity of heat transferred into the soil profile. Fire not only releases nitrogen to the atmosphere while leaving the majority of other nutrients in the ash residue, it also can lead to surface erosion of disturbed sites. Total loss of the organic layer due to fire would cause a serious loss of nitrogen on soils of low fertility. The risk of losing the entire organic layer increases when site preparation employs a crawler tractor to rake and push slash into piles for subsequent burning. If burning produces an extreme loss of surface nitrogen, soils with a high nitrogen content would recover with greater resiliency. The cooler spring burns on the Forest normally consume only the upper, drier undecomposed section of the organic layer, leaving behind sufficient organic material for future nitrogen cycling.

(6) *Erosion*. The primary effect of erosion on soil productivity is the loss of fertile top soils. West of the Cascades, soils with the highest potential for loss due to erosion are those developed from pyroclastic rock types. East of the Cascades, soils with surface mantles of volcanic ash and wind-blown deposits have high erosion hazards. Throughout the Forest, undisturbed forested soils have the lowest natural erosion rates, but it is impossible to avoid exposing the surface soil to some degree in the conduct of the Forest's activities. Results of such exposure vary by location and activity. Surface soil exposure during cable logging historically has not caused unusual soil loss on the Forest. On the other hand, skid trails with reduced infiltration rates due to heavy compaction have shown the degrading consequences of erosion and overland flow of water. The highest concern for soil loss by erosion occurs during road construction and on slopes that have lost their protective vegetative cover after being cut by roads.

The general consensus is that excessive soil erosion reduces future soil productivity, in addition to depositing sediment into streams. However, the changes in soil qualities have not been applied to predictive models, nor quantified in terms of short or long term productivity losses. Well-substantiated data show that removing the surface soil layer:

- Alters soil porosity.
- Alters bulk density.
- Reduces infiltration rates.
- Changes the soil structure.
- Changes the soil's composition.

The questions facing the Forest management are the magnitude and seriousness of these changes.

c. Soils in Relation to the Forest Environment

Soils created from parent rocks by never-ending geologic processes are a fundamental part of the biophysical environment. Soil qualities help to determine what species, mix, and vigor of plants can grow at any given time and place. If the physical or chemical properties of the soil change, the types and rates of plant growth will change in response. In the normal life cycle of plants, decomposed or decomposing vegetation contributes organic matter to the Forest's soils and increases their productivity.

(1) *Sediment*. Flowing water and rain can break soils down into particles. When these particles are carried within moving water, they produce sediment. Sediment suspended in streams reduces the clarity of water and its quality. A high load of sediment can impair a stream's ability to sustain trout and salmon. The natural levels of suspended sediment in streams is in part related to the ratios of clay, sand, and silt found in the soils through which they flow. Soils developed from volcanic rocks are relatively high in clay and silt content, and therefore they contribute more suspended particles to the streams than soils developed from glacial till with lower percentages of clay and silt. Thus the quality of a fish habitat depends to some degree on the type(s) of soil a stream passes through.

(2) *Fire*. As previously noted, fire can impact the Forest's soils in different ways. On the one hand, intense fire can alter the soil's physical characteristics and impair nutrient cycling. On the other hand, a light burn under relatively moist conditions may return nutrients to the soil, and stimulate the activities of ammonifying microbes by increased soil reaction and temperatures.

d. Relationships to the Human Environment and Management Concerns

All outdoor activities, whether in pursuit of economic or recreational goals, have the capacity to affect Forest soils. Human activities in this context include all aspects of timber management, road building, other construction, maintaining or using forest facilities and lands, mineral and energy exploration, range uses, and Native American uses.

Planning the management of forest resources requires full consideration of soil characteristics. Two fundamental characteristics are fertility, and susceptibility to compaction.

Nowhere are these considerations more evident than in timber management. In the short run, protecting soil productivity may appear contrary to the economic interests of nearby communities by increasing harvest costs. In the long run, however, minimizing practices which could damage soil productivity, or lose fertile soils through erosion, could prevent later economic hardships due to reduced timber production.

Current management directs that compaction on harvest sites must be limited to no more than 20 percent of the harvest area. This goal may be put out of reach if both tractor harvest and machine piling are employed. Efforts to reduce soil compaction to the practicable minimum are the rule, and as a result some heavily compacted soils are being tilled. However, the fact remains that approximately half of the logging on the Forest continues with tractors and other ground equipment. This equipment is favored by operators as the most economical to use except where cable systems or helicopters are used on steep slopes. These do the least damage to the soil, but are more expensive to operate. The current situation on the Forest, mentioned earlier, is that compaction and soil movement resulting mainly from timber harvest have reduced site productivity on approximately 30,000 acres. Since detrimental effects of compaction have been known to last at least 40 years, this damage to the soil has serious implications for future timber production. A reduction in soil productivity correspondingly reduces the growth of established trees and makes it more difficult to regenerate young trees. If a site is damaged severely, costly site rehabilitation may be the only way to correct it; otherwise trees may not be grown in it for many years. The choices are either to counteract lost soil productivity or accept reduced availability of timber for future harvests. Machine-compacting of forest soils can be reduced by broadcast burning of logging debris instead of yarding and piling if air quality standards can be met. (Broadcast burning, yarding, and piling are fully described in this chapter's section, 12. Fire.)

Road building, like timber harvesting, involves separate risks of damage to the Forest's soils. Major problems are increased erosion and resulting sedimentation, especially when road building takes place on steep slopes or lands adjacent to streams, lakes, or wetlands. Current management direction emphasizes steps to prevent excessive erosion and sedimentation.

Although recreational activities are major resources of the Forest, their impact on the soils is often compaction and erosion. Hikers, horses, and off-road vehicles present the biggest problems, although short-cutting of switchbacks on trails have caused severe damage in some areas.

Mineral and energy exploration, range uses, and Native American uses of the Forest's resources may result in different types of soil degeneration, but these effects are usually localized and should be controlled through close management supervision.

4. Water

a. Background: The Importance of Water

Water is one of the Forest's most valuable and extensive renewable resources. Approximately 40% of Oregon resi-

dents rely on the Forest for domestic water supplies. Forest water is an economic resource when used for irrigation and for fish production as well as domestic water supplies. In addition, it contributes scenic and recreational benefits such as the numerous waterfalls in the Columbia Gorge. Finally, it makes possible the Forest's timber and vegetative cover, which in turn support the logging industry and wildlife. To put it succinctly, without the Forest's water, there would be no Forest.

b. Existing Situation

The Forest has five major drainage and river basins as shown on the accompanying map.

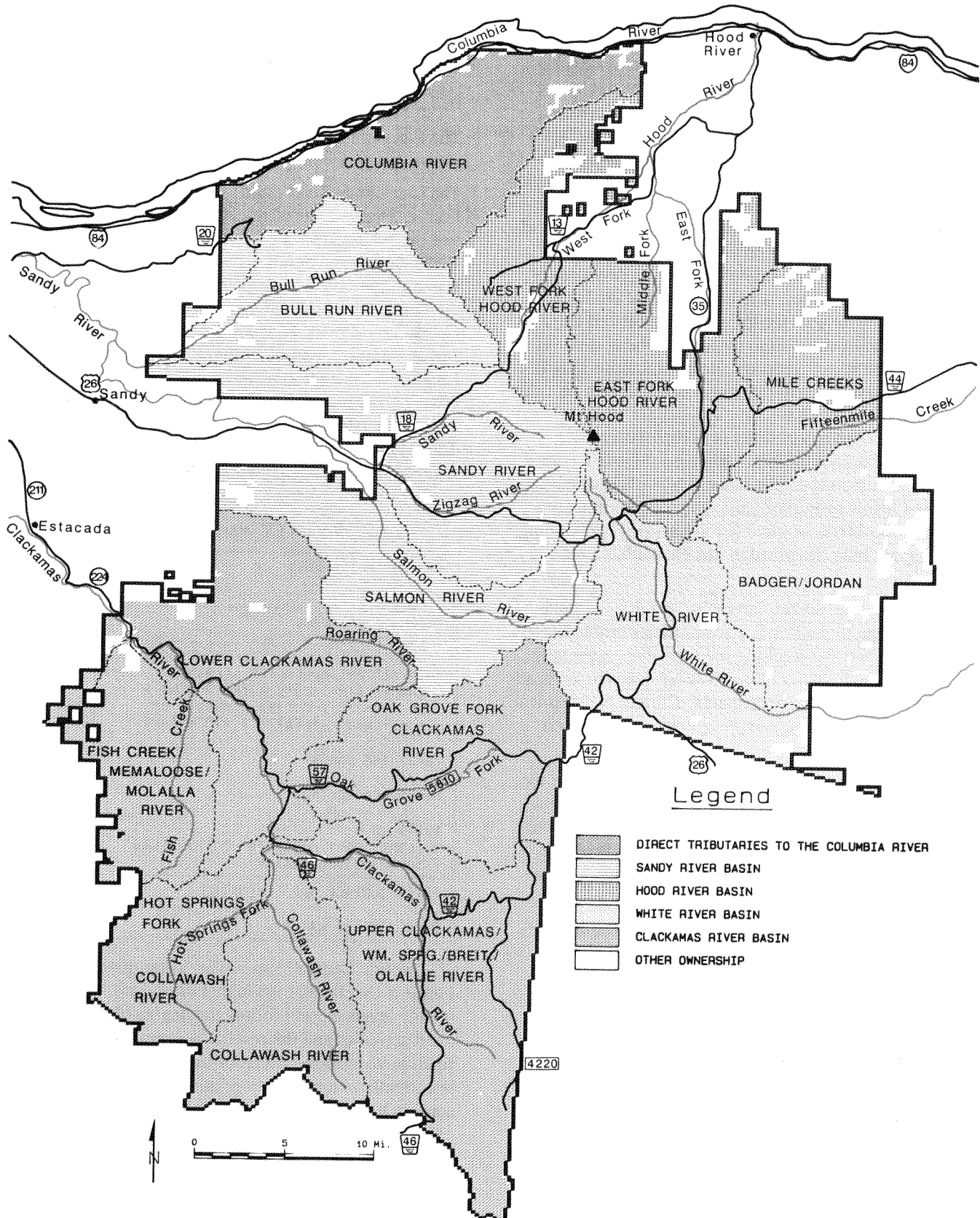
The Clackamas River drains the southernmost part of the Forest. Head waters of the Hood River, the Sandy River, and the White River are on Mt. Hood itself. The Bull Run Watershed, in the Sandy River basin, delivers the most water on the Forest (on a permit area basis) because it gets the lion's share of the area's precipitation. The Miles Creeks drainage in the Hood River Basin, and the Badger-Jordan drainage, part of the White River basin, deliver the least water because they are on the east side of the Cascades barrier and receive comparatively less precipitation. These watersheds lie in what is called a "rain shadow". The Forest's water supply by types of water bodies is summarized in the accompanying table.

Table III-1
Bodies Of Water On The Forest

TYPE OF WATER BODY	SURFACE AREA IN THOUSANDS OF ACRES
Perennial streams (Water flows all year, 1,640 miles)	4.0
Intermittent/ephemeral streams (water flows only a few months a year, usually during snowmelt or continued rainfall, 3,410 miles)	4.1
Lakes and ponds	3.5
Seeps and springs	28.6
Wetlands (continuous moisture in the areas' soil and vegetation)	31.2
TOTAL SURFACE AREA OCCUPIED BY BODIES OF WATER	71.4

(1) *Quality.* Generally speaking, water quality on the Forest is excellent at the higher elevations. The range of quality levels closely follow the degree of past management activities and the resultant current condition of riparian vegetation. Much of the Forest's upper elevation is currently in a relatively pristine condition with many acres in a wilderness or unroaded condition. This situation changes dramatically as one moves from the upper to the lower elevational zones. At the lower areas, intensive

MAJOR DRAINAGES AND RIVER BASINS



management activities have been occurring for a number of years. These activities, particularly road building and timber harvest in the riparian zone and large debris removal from the channel system, have led to some serious water quality problems.

Aquatic habitat condition, which includes water quality, is dependent on the condition of the riparian zone, particularly the old growth timber component. This component moderates water temperature by shading the surface, provides structural channel stability (provides and maintains dynamic equilibrium), and increases fish habitat diversity. In much of the mid-low elevation, this component is now missing. This has led to elevated summer water temperatures and varying degrees of channel instability. Unstable channels are characterized by riffle dominated wide, shallow stream courses with raw banks that are easily eroded during high flow events. Systems in this condition are characterized as being in a poor aquatic habitat condition.

Most of the Forest's lower elevation streams express varying degrees of elevated summer water temperatures and less than desirable aquatic habitat condition. This has been documented with both published (Everest et.al. 1982-1985) and unpublished data for: Eagle Creek, Fish Creek, Lower Clackamas River, Hot Springs Fork, Callowash River, Still Creek, Ramsey Creek, Five-Mile Creek, Lake Branch Creek, Jordan Creek, Tygh Creek, Badger Creek, Gate Creek, and Rock Creek.

A persistent problem is giardia, microscopic organisms that cause severe intestinal problems in human being. Risk of disease caused by these organisms is quite low because they are small in number. Nevertheless, surface water on the Forest cannot be considered drinkable by people without treatment no matter how clean and clear it appears.

Sediment from another source occurs seasonally. That is the sediment of fine particles called glacial flour deposited into streams by melting glaciers on Mt. Hood. Glacial flour gives affected streams a milky appearance. This is a common annual phenomena in the White River, the Sandy River, and the East and Middle Forks of the Hood River.

(2) *Flooding*. Floods usually occur in the winter when a mass of warm air moves in from the Pacific Ocean bringing heavy rain and rapid melt of the snowpack. The extent of flooding is determined by the quantity and duration of rainfall, persistence of the warm air mass, and the amount of snowpack. Damaging floods occur about once every ten years in the Cascades, the largest in recent history being the flood of December, 1964, followed by the flood of 1974.

Different levels of flooding happen in cycles in every stream system, so that flood risks and resulting damage are important management concerns. Common floods normally cause few problems unless the stream system involved

is in poor condition. Floods in more damaging classes occur less frequently, but can cause severe problems with scars remaining 20 years or more.

c. Water in Relation to the Natural Environment

(1) *Stream Stability*. The way water influences the Forest's natural environment would be difficult to exaggerate. This has already been pointed out in comparisons of east and west side flora and fauna. The preceding description of flooding also showed there can be too much of a good thing. Environmental damage due to floods depends not only on the quantity of water and its velocity, but also the stability of the stream. In turn, the stability of the stream system depends upon its environmental condition and shape.



Still Creek

Stream stability is measured by its ability to recover from periodic incidents like flood or fire. These forces have the power to shape the affect large parts of the landscape as well as the aquatic resource itself. If a stream has been destabilized by the removal of vegetation, changing of the channel, or other major alteration, the stream will suffer a correspondingly higher risk of permanent damage from natural events. In the past, large woody debris was routinely removed from streams causing their channels to degrade and widen. This practice holds flood waters within the widened channels and causes downstream flooding instead

of letting the flood waters dissipate their force by spreading over the floodplains. Consequently, channel systems that have undergone this practice are at risk for severe damage during flood events.

(2) *Fire.* When trees are removed from a site due to either fire or human activity, the reduction in vegetation usually alters the distribution and amount of runoff. Erosion, sedimentation, or flooding can endanger aquatic habitats and degrade the stream channel and watershed. Human structures and facilities can be damaged unnecessarily. Changes caused to runoff may last for 40 years, with the worst changes taking place in the first decade. After that, the effects decline rapidly as the newly developing forest reduces the amount of bare soil and improves runoff conditions. By the end of the second decade, the effects of tree removal are about 10 percent of the initial impact.

A very large wildfire can drop ashes into streams, lakes, or ponds and cause temporary problems with domestic water supplies. Sedimentation due to fire can also increase until ground vegetation recovers. On the whole, however, fire threatens water much less than it endangers other resources.

(3) *Fish and Wildlife.* A concern of high priority is the Forest's fish habitat. Wild as well as hatchery-reared fish, including six hatcheries rearing salmon and steelhead trout, depend on Forest water. Since the need for high-quality, cool water was discussed in an earlier part of this section, the subject will not receive amplification here.

Wildlife, like fish, must have adequate supplies of fresh, high-quality water. Fortunately, the presence of wildlife does not normally create a significant threat to water quality.

d. Relationships to the Human Environment

Major aspects of the human environment as affected by the Forest's aquatic resources include:

- Domestic water supplies for Portland and other communities.
- Agricultural irrigation.
- Generating electric power.
- Fish habitats for pleasure and profit.
- Water as a cultural amenity.

(1) *Domestic Water Supplies.* Water furnished by the Forest for domestic uses has been valued as high as \$24 million per year. For convenience, quantities used are quoted in "acre-feet;" that is, an acre-foot is one acre of land covered with water one foot deep. Portland and an adjacent service area consume 138,000 to 158,000 acre-feet of water per year from the Bull Run watershed. Dodson, a small community, uses less than three acre-feet per year. The Dalles uses about 6,000-acre-feet per year. The total

water consumption of surrounding communities, for all purposes, considerably exceeds 165,000 acre-feet per year.

The accompanying map III-3 depicts the municipal and fish hatchery supply watersheds on the Mt. Hood Forest.

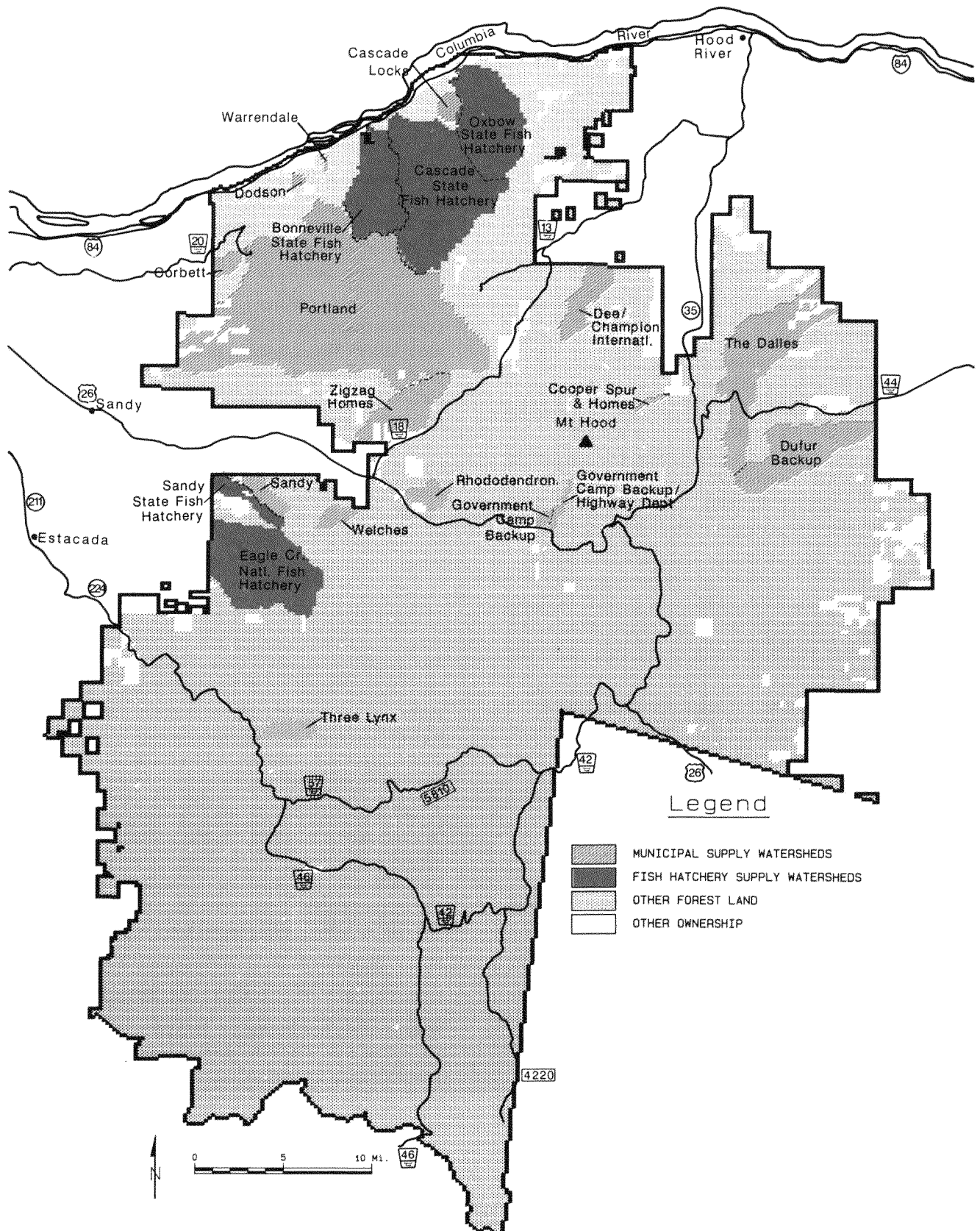
(2) *Irrigation.* The use of Forest water for irrigation fluctuates along with its value to the agricultural community. Horticulturalists estimate that irrigation can almost double crop yields; however, farm/orchard use of water is not uniform and therefore, its benefits may not produce crops to their full potentials. Typically, over-irrigation is common early in the growing season, and under-irrigation late in the season. In cool growing seasons, precipitation is higher and the demand for irrigation lower. In some water short years, like 1983 and 1985, irrigation demand can exceed supply. Demand may be further magnified if winter precipitation falls well below normal as it did in 1984-85. Dry winters mean below normal recharging of soil moisture and the aquifers which sustain summer streamflows. As a general rule, however, the Forest produces more than enough water to meet demand. In Wasco County, water from the Forest irrigates about 43,000 acres, a benefit valued at nearly \$390,000 per year based on the use of two acre-feet of water used per irrigated acre.

(3) *Hydropower.* Interest in generating electricity with Forest water is periodically high. Hydropower generation has gone on in the Clackamas River drainage since the installation of the Three Lynx power plant in the mid-1920's. Following enactment of the Pacific Northwest Electric Power Planning and Conservation Act of 1980, 16 U.S.C.839., individuals have investigated a large number of sites for the purpose of harnessing the potential hydropower of the Cascades and selling the electricity to local utilities. Fifty-one proposed projects, including those which overlap or duplicate, have been or are currently being investigated or developed. While most of these have been deemed infeasible, if proposed and existing projects were to produce at their estimated rates, they would yield 1460 million kwh per year. The estimated annual water benefit value would be more than \$3 million.

(4) *Fish for Pleasure and Economic Benefits.* Water quality is an important component of aquatic habitat condition, and is very important for controlled habitat such as fish hatcheries. Six fish hatcheries, depicted on the map on the next page, use Forest water to produce an average of 23 million anadromous fish per year. Without good water quality, both the hatcheries and wild fisheries are unable to produce at optimum levels. The Fish section of this chapter provides more details for this resource.

(5) *Water as an Amenity.* There is no accepted way to put a value on the mere presence of a body of water. Yet it is a fact that human beings, like all animals, do not usually stray far from water as a visible presence, not merely a life-sustaining substance. Lands overlooking water bring

MUNICIPAL AND FISH HATCHERY SUPPLY WATERSHEDS



premium prices, and developers even create artificial lakes to increase the value of their lands. Thus the many bodies of flowing water and still lakes on the Forest provide a special if unpriceable amenity that draws vacationers, picnickers, campers, hikers, and just plain sightseers. The section on Communities in this chapter develops this concept more fully.

e. Management Concerns

Almost every activity on the Forest impacts to a greater or lesser degree on its water resources. Management direction of the Forest's water, in this context, includes programs for timber harvesting, road building, flood control, hydropower, and above all, the achievement of specified water-quality goals for both the Forest and nearby community use.

(1) Timber and Water. Management policies of the Forest Service require that designated quantities of timber be made available for harvesting. Previous examination of logging practices have shown that some can seriously impair water quality. Clearcutting that removes trees adjacent to rivers or streams also can raise water temperatures and decrease channel stability. Compaction and road building associated with timber harvesting increase sedimentation, particularly the latter. Research has shown that 80-90 percent of the increase in sediment resulting from timber management activities can be attributed to the transportation network (Magahan, 1972; EPA, 1975).

Research in the United States has also shown that timber harvesting, especially clearcutting, can increase water yields from small watersheds. However, greatest increases occur at a time of year when water is in short demand (i.e., spring snowmelt or storm events) thus requiring reservoir storage to be viable.

The Forest has received no request for increased water yield by users on either side of the Cascades even though shortages have occurred on the eastside in two of the last five years. No change is expected in the foreseeable future. In the absence of increased demand, efforts to increase water yields are not anticipated.

(2) Road Building and Water. This activity requires close management direction due to its high impact on water quality and the stability of the drainage system as a whole. Logging and other timber management activities require roads, whose compacted surfaces tend to act as collectors of surface water. As this water moves down the road or along a roadside ditch and accumulates sediment, it eventually finds its way back into the Forest's stream channels. The sediment-laden water is delivered to stream drainages at a much more rapid rate than if it had infiltrated the Forest floor before finally reaching the stream.

(3) Flood Control. The risks of various types of floods are important management considerations in planning develop-

ments assumed to last many years. Bridges are expected to last 50 years; a commercial timber planting's rotational cycle is 80 to 125 years. To ignore the chance of severe flooding during the expected lifetime of a project would be poor planning.

(4) Hydropower Project Concerns. Management's main concern with respect to the numerous hydro-electric power projects proposed for the Forest is their potential conflict with other water uses. These projects could involve the diversion of water and various in-stream uses. The section on Minerals and Energy Management in this chapter provides details on this issue.

(5) Recreation, Wilderness, and Special Interest Areas. Although recreation on or near water may result in some local problems, as a general rule this type of human activity does not require special management programs to protect water quality or quantity.

(6) Protection of Water Quality. The water quality goal of Forest management is nondegradation of natural or existing quality. Water quality, or aquatic habitat condition, is dependent on the degree of disturbance in a watershed and particularly on the condition of the adjacent riparian area. Previous management activities have triggered mass failures (landslides, particularly from road building activities), and intensively harvested the riparian zones of many of the moderate to low elevation streams on the Forest. This has reduced overall aquatic habitat condition by adversely affecting water temperature (elevated summer water temperatures) and channel stability. The end result is a loss of other Forests' ability to provide favorable conditions of water flow as mandated in enabling legislation.

Not all the Forest's watersheds suffer from these conditions. Two notable exceptions are the Bull Run and the City of the Dalles Municipal supply watersheds. The stipulated primary management purpose is to provide "pure clear raw potable water". Consequently, special management activities have and continue to be applied to ensure the primary objective is met.

(7) Aquatic Habitat Concerns. Water quality is an important component of aquatic habitat. Generally speaking, if aquatic habitat condition is poor, one or more water quality parameters are in a less than desirable condition. Thus, the two are inseparable. The interested reader is referred to the Fish section of this chapter for a more detailed description.

f. Summary of the Current Situation.

Water quality conditions are directly reflected by trends in aquatic habitat. Over the past 10 to 20 years, Forest-wide aquatic habitat condition has declined. This represents the combined effects of management activities, implemented using past and current plans, interacting with natural events such as floods, windstorms, etc. Since the last

major flood event occurred more than 10 years ago (1974), this downward trend in aquatic habitat condition implies that substantial Forest-wide natural recovery has not occurred and that the potential for future reductions may be relatively high given another major (25 to 50 year return frequency) flood event may be high.

Although comprehensive, long term data required to quantify changes in aquatic habitat condition over time is lacking for most streams, observations suggest such changes are the norm on many larger stream systems of the Forest. The relative degree of alteration appears most closely linked with the extent and duration of active management such as timber harvest, roading and recreational development and use.

This trend assessment is based upon a variety of information sources including stream assessments, localized studies and a multitude of individual project-level evaluation of riparian and aquatic habitat condition. Major indicators used to assess trends in aquatic habitat condition include a variety of elements which control channel condition and structure, summer water temperature regimes and watershed conditions controlling the frequency and magnitude of damaging "rain on snow" flood events.

Alterations to channel conditions and structure typically reflect one or more of the following:

1. Loss of in-stream structure. This is most commonly reflected by reductions in large woody debris.
2. Channel straightening. This is evidenced by loss of meanders, loss of pool habitat and general increases in water velocity.
3. Channel widening as indicated by extensive sand and gravel bar development, multiple stream channels and extensive areas of actively eroding or unstable stream banks.
4. Channel downcutting, often reflected by flood plain and overflow channels inaccessible to all but the most infrequent flood flows.

Modifications of summer water temperature regime are most often reflected by increases in maximum summer water temperature and in the amount of daily fluctuation between maximum and minimum water temperatures, generally when maximum temperatures exceed 65 to 68°F beneficial uses such as natural and hatchery-based fish propagation are affected. Based upon results of past monitoring, elevated summer water temperatures are a relatively common condition mid and low elevation sections of the Forest's larger stream systems. Annual increases vary somewhat with summer weather and flow conditions. On the west side, a number of streams have maximum temperatures above 65°F. West-side streams in this category include: Lower Clackamas River, Fish Cr., Hot Springs Fork, Collowash R., and Still Cr., in the Sandy R. basin. Numerous east-side streams also exhibit elevated

temperatures. They are: Ramsey and Fivemile Cr. in the Fifteenmile basin; Lake Branch Cr. in the Hood R. basin and Jordan Cr. Lower Tygh Cr., Lower Badger and Little Badger Cr., Gate Cr., and Rock Cr. in the Whit R. basin. Summer temperatures as high as 80°F were recorded in 1986 on Lower Rock Cr. within the area of the Rocky Burn Forest Fire of 1973.

Watershed conditions, indicating increased probabilities of damage from "rain on snow" flood events, have been reported for several areas of the Forest. Using an assessment model developed by J. Christner, several watersheds have been recently evaluated. Numerous appear to be at, or above the "threshold" indicating increased risk. All have undergone active past timber harvest and roading throughout most of each watershed's area.

As mentioned previously, quantitative descriptions of trends in aquatic habitat condition are difficult due to a general lack of comprehensive data over time. One area where such information is available is Fish Cr., a tributary to the Clackamas R. This watershed is the site of an intensive, multi-year investigation (1982 to present) of aquatic habitat conditions and fish production capability as related to a major stream rehabilitation effort. This system is felt to be quite representative of many mid to low elevation Forest watersheds, particularly those on the west side. The system is fully roaded and has a history of active management, including timber harvests and reforestation as per past and current Plans. Field observations of riparian area and aquatic habitat conditions, prior to rehabilitative efforts, generally reflected many of the previously discussed indicators of downward trends in aquatic habitat. Findings from this investigation (Everest, et al. 1986) have begun to quantify the general observation, that "present habitat conditions vary significantly from historical conditions". In general, it has been found that, between the mid to late 1950's and the early 1980's, substantial changes in channel condition/stability, summer water temperature regimes and watershed condition have occurred.

Measures of reduced channel condition/stability include: a 34 percent loss of low flow pool habitat (Everest, et al 1986.); levels of large wood structure reduced by about 90% (about 2 pieces per 100m, Everest and Sedell, 1984 with about 20 pieces per 100m expected in undisturbed "old growth" stream (personal communication J. Sedell, PNW); and active channel widening and downcutting over at least 60% of the lower 11 miles of stream (personal communication D. Hohler, Estacada R.D.). Additionally maximum summer water temperatures, at the mouth of the stream, currently vary between 68-75°F. This represents an increase of 8-10°F from the estimated temperature regime in the late 1950's. Finally, watershed condition ratings, performed in 1986, show a major shift from a "low" risk rating in the late 1950's to one at or above the "high" risk threshold.

5. Air Quality

a. Background

Throughout the centuries before Europeans settled the Pacific Northwest, forest fires caused repeated periods of poor air quality. Some fires were set by lightning, others by people. Either way, smoke was very much a part of the scene.

In this century, industry, farming, and transportation in the Northwest became major economic factors, and the fires of new activities added pollutants to the air. Although fire suppression in recent decades has reduced smoke from wildfires, burning of debris left from logging slash has been a common forestry practice since the 1940's. In the Willamette Valley, annual grass-burning practices send up large amounts of smoke which travel to the east side of the Cascades.

b. Existing Situation

Increased national concern for air quality in the 1960's led to passage of the Amended Clean Air Act of 1970. Provisions of this Act were written to reduce the emissions of major pollutants, including small suspended particles called particulates, into the air. The Act did not stop smoke from slash and field burning from becoming a heated issue in the Portland Metropolitan Area and the Willamette Valley. Pollutant-carrying smoke from such burnings in the late summer and early fall is often trapped by air inversions which aggravate the problem. The air inversion lid goes on when air in the upper level is warmer than air nearer the ground. The warm air "lid" keeps ground-level air from rising and dispersing its load of pollutants. The fouled air just "sits still."

New legislation in the form of the Clean Air Act Amendments was enacted in 1977. This law attempts to deal with the problem of air quality in wilderness areas and National Parks by establishing three classes of air quality. Areas designated Class 1 are the most pristine with little or no degradation of air quality allowed. Mt. Hood and Mt. Jefferson Wildernesses have been designated Class 1. Air quality classifications have not yet been determined for remaining newly created wilderness areas. Under the 1977 Act, all federal agencies must comply with federal, state, and local procedural requirements for the control of air pollution. Since the Forest Service is a federal land manager, Mt. Hood National Forest is charged with protecting the quality of its Class 1 areas. None of the Forest's areas have been designated Class III. These are called "non-attainment areas" and suffer from very dirty air.

Between 1976 and 1982, the Forest burned an average of 6,900 acres of slash each year. The largest amount of burning during those years totalled 9,300 acres in 1976. The lowest quantity burned was 5,400 acres in 1979. Unpiled

slash burned as it lay on the ground (called broadcast burning) disposed of an average of 2,500 acres per year during this period.

c. Air Quality in Relation to the Natural Environment

(1) *Effects of Smoke.* The impact of smoke on the Forest's vegetation, wildlife, aquatic, and recreation resources is usually temporary. In fact, smoke has been a natural factor in the environment from prehistoric times. There is little difference in pollutants from natural and man-made fires, but there is a difference in the smoke's duration. Smoke from natural causes would normally be confined to short, intense episodes like a large forest fire. However, smoke from burning slash, although less in volume, lies over forest areas for longer periods of time. Smoke from field burning in nearby valleys intensifies slash-burning consequences.

(2) *Acid Rain and Dust.* Acid rain may constitute a potential problem. High mountain lakes are being studied to determine if acid rain now presents any measurable effects. Dust from road construction may impair air quality in local areas, but the problem is of short duration and does not require any special programs.

(3) *Effects of Timber Harvesting.* Forest management has four primary options for resolving the slash disposal problem. The least common is hand piling which is expensive and only partially effective with heavy material. Yarding of unmerchantable material (YUM) is expensive and may reduce wildlife habitat. A method often used is machine piling for burning, but heavy machines cause undesirable compaction, sedimentation, and are unsafe to operate on slopes greater than 35 percent. This leaves broadcast burning as the preferred treatment in many situations. Broadcast burning is a method of slash disposal in which an entire unit, usually a clearcut, is burned over. It is cost-effective, and when properly executed, creates spots for planting, prepares an excellent seed bed, and can dramatically reduce fire hazards.

Fire, however, remains a hazardous element in broadcast burning because the fire may escape. Extremely dry or windy days rule out broadcast burning due to its risk. Rainy or foggy days rule out this method because it is too hard to light the fires. Another restriction is the limitation on burning to days when atmospheric conditions will divert the smoke from populated and Class 1 areas.

(4) *Air Quality in Relation to the Human Environment.* If past is prologue, the demand for clean air will intensify, not diminish. The intensity of the demands may correlate to the expected increases in the populations of metropolitan Portland and the Willamette Valley.

The problem with polluted air is not hard to define: it hurts people, and sometimes it hurts them badly. Very fine par-

ticulates can be breathed into the lungs where they may stay indefinitely. Foreign materials in the lungs can cause a variety of diseases, or aggravate already-existing disorders. Particulates of any size can combine with other pollutants with synergistic effects. The action of particulates on human health is a reason the Environmental Protection Agency has made these materials one of the regulated pollutants.

Slash burning by itself might not present a serious management situation if its smoke were not added to the pollution caused by burning fields, auto exhaust, and smoke from wood stoves. The pollution caused by wood stoves used for heating is a comparatively recent development, having increased significantly within the last 10 years. Slash is a major source of firewood, and burning slash in household stoves does not keep the burning from adding to the air quality problem. Indeed, persons responsible for air quality have expressed concern about the potential pollution released by wood-burning stoves. The total effects of these fire by-products can be summed up by saying they give the Forest a smoke-management problem.

(5) Air Quality in Relation to Recreation and Scenic Views. Smoke has an all-too-visible effect on recreation and scenery. If the mountains disappear behind a haze of smoke, there is little if anything visible to admire. One of the reasons people elect to live in the regions surrounding the Forest is its scenery, and no one expects people to accept the loss of the Forest's scenery willingly. Fortunately, the effects of smoke from slash fires and campfires are localized and they normally disappear within two to six hours.

d. Management Concerns

A Memorandum of Agreement with the Oregon Department of Environmental Quality (DEQ) was accepted in 1968 by state agencies, federal agencies, and private organizations as the model for managing smoke from slash fires. Under the agreement, slash will be burned only in compliance with state regulations and when atmospheric conditions divert smoke from Portland and the Willamette Valley.

The Forest Service is presently responsible for air quality only in Class 1 areas. So far these are limited to Mt. Hood and Mt. Jefferson Wilderness Areas. However, there are other important constraints. On the west side of the Forest, burning with a prevailing east wind is prohibited because it would carry smoke into Portland. West winds would blow smoke from Portland but into Class 1 areas. To cope with the requirements, burning conditions are carefully monitored in cooperation with the Oregon Department of Forestry to reduce the likelihood of smoke from prescribed burns entering the Willamette Valley and Class 1 areas.

During the summers of 1982-83, the Forest cooperated with the DEQ to monitor air quality on the Forest. A particulate sampler was placed at Multopor Ski Bowl (Mirror Mountain), and visibility was measured at Hickman Butte Lookout. These sites are near the Mt. Hood Wilderness Area. Results indicated that smoke from slash burning had reduced visibility during the times sampled, but the smoke's origin(s) was not determined. Haze was evident on many days. These are generalized air pollutions beyond the scope of this DEIS.

Prior to 1976, burning averaged 105 days per year. Between 1976 and 1982, however, burning was allowed on average 52 days per year. During the same period of time, the total amount of slash burned per year was cut from an average of 77 tons per acre to 40 tons per acre. Better use of woody debris accounts for the burning reductions.

Technology has been developed to determine the best time to burn, and how to use labor more efficiently. These advances make possible the full use of all available burning days. They also provide the most efficient methods of burning slash while at the same time reducing smoke problems. The critical period for air quality is July through August, the period of greatest recreational uses. Therefore the Forest has reduced the burnings during this period. In 1983, slash burned during the critical months was only 7 percent of the total burned during the year. The Forest presently maintains its slash treatment schedule, and there is no backlog of unburned slash.

6. Vegetative Zones and Their Plant Communities.

a. Background

Soil types, moisture, climate, and elevation determine the species, locations, and growing habits of the Forest's plant life. Different combinations of geology and growing conditions have created the following six different vegetative zones, plus a botanical area unique in its own right - the Columbia Gorge corridor which belongs to neither east nor west side of the Forest.

(1) West Side Forests: the Western Hemlock Zone. Growing conditions in this zone are determined by its low elevation and wet, mild climate. Extending upward to about 3,000 feet, its temperatures range from average January lows of just about freezing to the mid-twenties F., and average July highs to about eighty degrees F. Its climate is tempered by the moist, west winds from the Pacific Ocean which deliver from 60 to 120 inches of precipitation per year. The zone's higher elevations have its coolest and wettest conditions.

Western hemlock is the predominant tree in sites left undisturbed for hundreds of years. However, undisturbed sites are infrequent in the zone due to windstorms, fires, earth

slides, volcanic activity, and, of course, logging. The fast-growing Douglas fir, the most abundant tree in the zone, is also the most valuable commercial species on the Forest. A mature Douglas fir stand may be dense with little vegetation underneath. Or it may be so open that associated shrubs and western hemlock grow underneath. Western red cedar is a frequent occupant of wet sites in this zone.

The species and density of shrubs in the zone vary according to the moisture in the individual sites. Common shrubs are Oregon-grape, vine maple, red huckleberry, rhododendron, swordfern, and salal.

(2) High Elevation Forests: The Pacific Silver Fir Zone.

Growing conditions in this zone are determined by its 3,000 to 5,000 feet elevation, cool to cold climate, and precipitation. Much of the precipitation falls as snow.

The zone supports a variety of conifers including silver fir, western hemlock, Douglas fir, noble fir, and western white pine. Silver fir can withstand snow damage, and if a site remains undisturbed for 750 years or more, this species will dominate. A stand of trees about 400 to 500 years old may consist of large, scattered Douglas firs, and numerous silver firs.

Shrubs under trees in this zone may include huckleberries and vine maple found together, or they may consist of rhododendrons. Herbs like bunchberry or queen cup bead lily may be present. Bracken fern and thimbleberry often dominate the high meadows.

(3) High Elevation Forests: The Mountain Hemlock Zone.

Growing conditions in this zone reflect its elevation from about 5,000 feet to timberline, cold climate, and high precipitation. The highest forested zone, it extends somewhat like a band around Mt. Hood comparatively wider on the western side than on the east. Its snow cover lasts six to eight months of the year. Most of the precipitation ranging from 64 to more than 100 inches per year falls as snow that accumulates in a snowpack as deep as 25 feet.

Due to the differences in plant life in this zone, it has been divided into two subzones, lower and upper. Major species of conifers in the lower subzone (the closed forest) are mountain hemlock, silver fir, subalpine fir, and lodgepole pine. Noble fir, Alaska cedar, Engelmann spruce, western white pine, and Douglas fir may be found in lesser quantities. Mountain hemlock is most abundant on the west side while subalpine fir is most abundant on the east side. Mountain hemlock, silver fir, and big huckleberry often associate together. Alaska cedar and Cascade azalea grow in wet sites. Bear grass is a common dominant of the mountain hemlock zone understories. The lower zone has a few permanent meadows with huckleberries, beargrass, mountain ash, and spirea.

Subalpine fir is the most widespread conifer in the upper subzone, followed by mountain hemlock and whitebark

pine. Throughout this zone, meadows mix with forested areas which vary in size from patches of trees to trees standing alone. From timberline down, trees in this zone stand erect. Trees in many sites closer to the alpine zone become more like shrubs, and often appear to grow horizontally forming tangled mats of brush. This brush is called "krummholz," which translates in English to "crooked wood."

(4) High Elevation Forests: The Alpine Zone. Growing conditions in this zone are rugged. Above timberline and lying just below the mountain's permanent snow and ice, the zone's wind, snow, and cold are extreme. Much of the zone is steep slopes with glaciers, bare rocks, and rubble.

Growth in this zone consists of meadowlands which vary according to the characteristics of the sites. On moist slopes and ridges free from snow three to four months of the year, heather and huckleberry dominate. On well-watered slopes, meadows are lush with showy wildflowers like lupine, paintbrushes, fawn lilies, and pasque flowers. Along alpine streams, monkey flowers and coltsfoot do well. Black sedge grows in cold, wet areas free of snow less than three months. Warmer, drier parts of the zone support grassy meadows often with fescues accompanied by cinquefoil, lupine, or asters. Even the really tough sites such as pumice slopes, gravelly areas, unstable areas, and bare rock can grow pioneer plants like saxifrages, phlox, and knotweed.

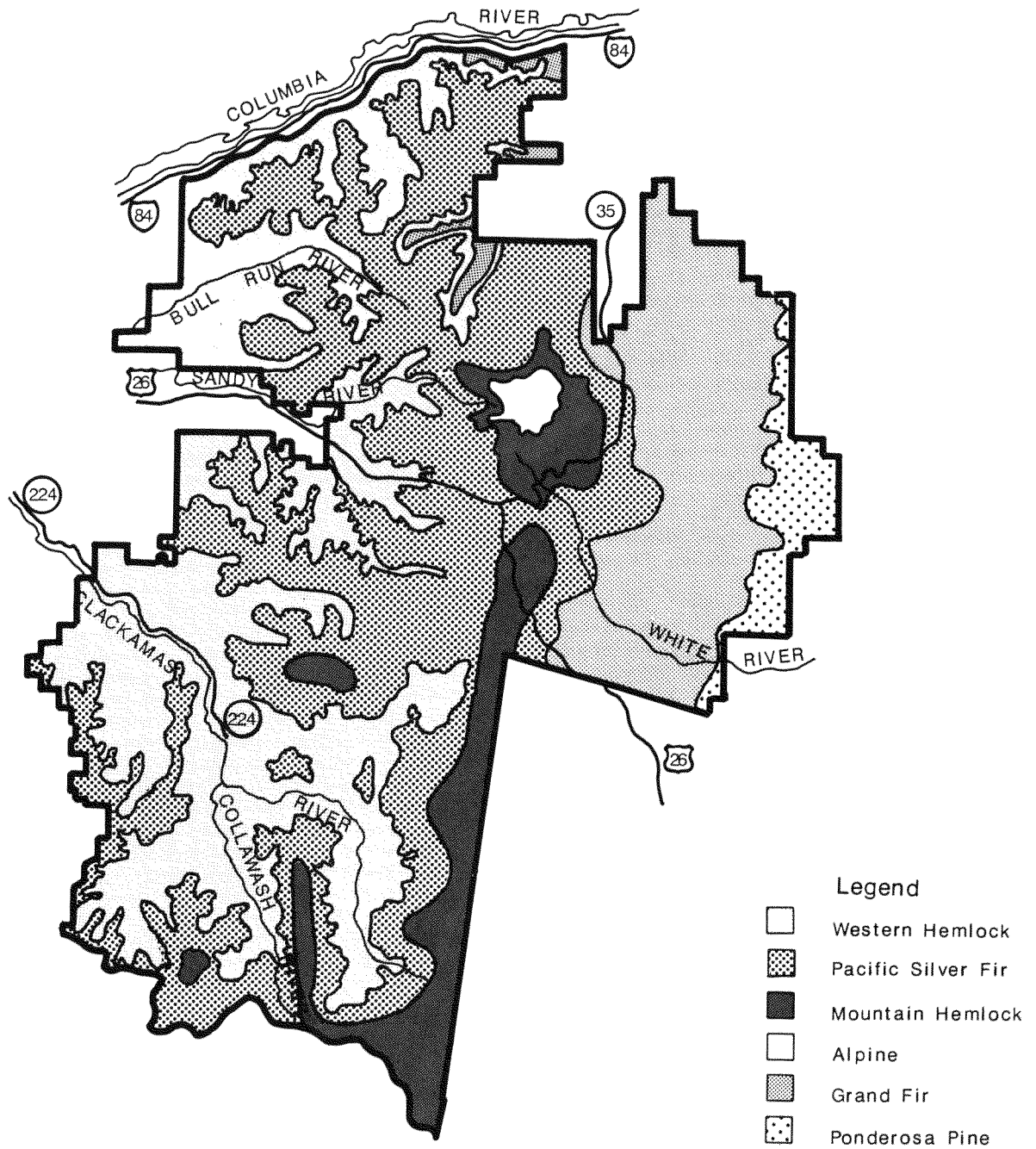
(5) East Side Forest: Grand Fir Zone. Growing conditions in this zone reflect its 2,500 to 3,600 feet elevation, with moderate temperatures and precipitation. The average January temperature is about 23 degrees F., and the average July maximum is about 80 degrees F. The zone receives about 43 inches of precipitation annually but only about two inches of that fall in the summer. Snowfall averages about eight feet per year.

This zone's most common tree is grand fir, followed by ponderosa pine, lodgepole pine, western larch, and Douglas fir. Any one of these conifers may dominate a particular stand. Conifers like Engelmann spruce, subalpine fir, mountain hemlock, and western white pine grow in localized areas, or in small numbers.

Oregon boxwood or big huckleberry usually grow in association with grand fir. Baldhip rose and prickly currant may be present, although the shrub cover is usually sparse. The zone supports many species of herbs including such lovely flowers as anemones, trillium, and lupine. Coral-root and pinesap grow under dense canopies. Meadows usually composed of grasses and herbs like tufted hairgrass, red fescue, clovers, and asters occur intermittently in the zone.

(6) East Side Forests: The Ponderosa Pine Zone. Growing conditions in this zone are characterized by sparse rainfall and widely fluctuating temperatures. Hot daytimes in sum

VEGETATIVE ZONES



mer give way to chilly nights. Winter temperatures are low with high snow cover possible. This zone is much like the continental interior of the western states because most of the moisture from prevailing west winds fails to make it over the Cascade Crest. The zone is a narrow band only nine to eighteen miles wide.

Ponderosa pine associated with Oregon white oak and occasionally Douglas fir make up this zone's forests. Ponderosa pine forests are open, enabling sunlight to reach the ground. Bitterbrush and Idaho fescue occur throughout. There is also some manzanita.

The accompanying map indicates the general locations of the six vegetative zones just discussed.

(7) *Forage Component.* Shrubs, grasses, and forb plants make up a "Forage Component" of the Forest's vegetative zones. The amount of sunlight that filters through the overstory determines the amount of forage growing in any part of the Forest. Portions of the Forest without overstory support a forage component that is more or less constant. Where there is an overstory cover, the forage component is transitory and varies with vegetative manipulation of the overstory, or with fire history.

When the overstory is removed, whether through timber harvesting, or burning brush or hardwood, ground vegetation increases the forage component. As the overstory grows back and shades an area, the ground vegetation loses vigor and eventually the forage component declines.

The forage component is extremely important to animals which depend on it for food and sometimes cover. When livestock is introduced, it grazes the forage component. An area of the Forest where forage depends on removing the overstory to support vegetation for livestock grazing is termed a "Transitory Range."

(8) *The Columbia Gorge.* On the north boundaries of the Forest lies one of Nature's unique formations, The Columbia Gorge. It is the only sea level gap through the mountains between the Fraser River in British Columbia to the Klamath River in California. It is especially unique in showing how the hemlock/Douglas fir forest on the west side of the Cascades translates into the ponderosa pine/oak forest on the east side. Unusual plants including the Calypso orchid, white shooting star, and Howell's daisy grow as localized populations in the Gorge.

7. Riparian Areas

a. Background

Riparian areas occur wherever water meets land. They are found adjacent to rivers, streams, lakes, ponds, seeps, and springs. Although they represent only a small share of the total land base, riparian areas are a critical source of diversity for the Forest ecosystem. A number of resources including fish, water, and selected species of wildlife and

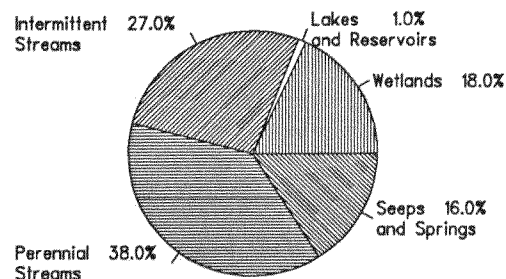
plants are directly dependent upon them. Riparian areas provide some of the most important wildlife habitats in the forests of Western Oregon and Washington. More habitat niches are provided in riparian areas than in any other type of habitat (USDA Forest Service, 1985). These areas also have major influences on aquatic habitat (i.e. fish habitat and water quantity and quality). Vegetation stabilizes streambanks, shades the water, filters sediment, and provides a food source for the aquatic system. Large wood and logs stabilize stream channels, control the routing of sediment, and provide complexity to the aquatic habitat by shaping pools, riffles, and gravel bars (Sedell et. al., USDA Forest Service, 1983).

Riparian areas include floodplains, wetlands, and the streams, lakes, reservoirs, or other bodies of water which make up aquatic ecosystems. Riparian areas also include lands and vegetation which form a transition zone between aquatic and upland ecosystems.

Riparian areas on the Forest are identified as being associated either a running water group or a standing water group. The character of the water associated with each area determines, to a large extent, its general characteristics, functioning, and relationships to other resources. The enormous diversity of riparian areas on the Forest is suggested by the following divisions into groups and sub-groups.

Figure III-2

RELATIVE COMPOSITION OF THE TOTAL FOREST RIPARIAN AREA BASE



Total Riparian Area Base = 175,000 Acres

Group One: Running Water (Streams)

1. Fish-bearing and perennial.

2. Intermittent.

Group Two: Standing Water

1. Lakes and reservoirs.
2. Wetlands: bogs, wet meadows, marshes, etc. These normally occur on slopes less than 30%.
3. Seeps/springs. These normally occur on slopes more than 30%.

According to a 1982 inventory, riparian areas occupy about 16% of the Forest, or 175,000 acres. This acreage does not include the surface area of flowing or standing water. The method used to calculate the acreage of the riparian areas may be helpful in understanding their nature and extent. The riparian area of fish-bearing, perennial streams was calculated as the space between each bank and lines parallel to them, 100 feet upland from each. A similar technique was used for intermittent streams; however, a width of 50 feet from each bank was applied. The section of this chapter entitled Water defines and describes the acreage covered by water. As the accompanying graph shows, fish-bearing, perennial streams and intermittent streams occupy approximately two-thirds of the Forest's total riparian areas.

Note: If the entire Bull Run drainage is added to the riparian inventory then a total of about 285,000 acres could be considered eligible for riparian management.

b. Relationships to the Natural Environment

The Forest's riparian ecosystems support a wide variety of natural resources such as water, fish, soils, wildlife, and vegetation, including sensitive species of plants and animals. These resources would change drastically or fail to survive if substantial changes in the ecosystem were made. Of the estimated 265 species of wildlife on the Forest, 208 use riparian areas regularly. Forty species depend on them directly. All 48 species of fish on the Forest rely on riparian areas to keep the water livable. Twenty species of sensitive plants survive because of them. Riparian ecosystems are not only responsible for much of the Forest's biological diversity, they are also the single most productive and diverse component of forest and range commodities.

Streams directly influence adjacent riparian vegetation in drier areas of the Forest. The acreage of standing water riparian area (lakes, reservoirs, seeps, and springs) was based upon Forest-wide field mapping (K.M. Geyer, 1982). Differentiation between wetland and seeps/spring areas was facilitated using slope steepness: none occurring on slopes greater than 30 percent were classified as wetlands. The character of surface water controls the type and extent of aquatic habitat and influences the type and diversity of vegetation which occurs (USDA Forest Service, 1985). Intact riparian systems are an essential component

of the Forest's natural environment by recharging ground water and otherwise providing a steady supply of high-quality water to both plants and animals. These systems also operate to control violent winter floods by slowing and storing run-off.

Riparian areas strongly influence the quality of fish habitat. Vegetation, including large trees, directly contributes to the food base of aquatic ecosystems as well as provides "structure" which shape intricate networks of pools, riffles, and quiet backwaters and side channels. Riparian areas also control or influence: water temperature; sediment introduction and routing from upland areas; hiding cover for trout, steelhead and salmon; food inputs of terrestrial and aquatic insects (Mechan et. al., USDA Forest Service, 1977). Figure III-2, on the previous page, summarizes the relationships of riparian areas to aquatic ecosystems.

c. Relationships to the Human Environment

Of all of the Forest's resources, few if any would rank higher in importance to human beings than its riparian-dependent resources. Demands on them, especially fish and water, are already high and will continue to be high. (Sections on Fish and Water in this section provide additional details about these two resources.) Riparian areas play a vital role in maintaining other resources of benefit to the human community, such as timber, forage, recreation, and visual areas. The following quotation sums up key relationships between riparian resources and mankind.

"Riparian zones are important for many other types of land use. Highly productive timber sites frequently occur along streams and around wetlands or lakes. Livestock utilize vegetation in riparian zones more heavily than in other areas because they concentrate there for water, shade, and succulent forage. Riparian zones are used for road locations, particularly in mountainous, rugged terrain. Rock and gravel for building roads have been taken from streambeds and their banks as well as from floodplains. Mining has direct and indirect impacts on riparian areas. Recreationists concentrate their use in wetland and riparian areas where scenic values are high. Riparian zones are preferred for recreational developments such as campgrounds and summer home sites. Because of these conflicting uses, riparian zones are recognized as critical areas in multiple use planning (Brown, 1985)."

d. Management Concerns

The primary focus of current management is on stream-adjacent riparian areas. Other types of riparian areas are generally recognized as special wildlife habitats. The main concern in the management of streamside areas in current plans is minimizing the impact of sedimentation, especially from landslides. Approximately 5,000 acres of streamside riparian areas are classified as full protection leave areas

due to high risk of sedimentation. (Timber Management Plan, USDA Forest Service, Mt. Hood NF, 1980). Remaining areas, unless affected by such considerations as visual management or special interest, usually have limited direction regarding other resource management activities (e.g. as timber harvest, developed recreation, and grazing) and their possible impact to riparian areas.

Beginning in approximately 1980, new management concepts recognized a wider range of riparian area types and their values, emphasized ecosystem management for riparian-dependent resources, and called for site-specific riparian area delineation and prescription development. Since 1982, increased knowledge has highlighted the need for more sophisticated management to stem the downward trend in condition of the Forest's riparian areas. Declining riparian area conditions reported by field-level biologists, hydrologists, and soil scientists are substantiated by site specific studies completed Forest-wide. In general these trends are most prominent in watersheds having long term or large scale disturbance. Most common forms of disturbance are road building, timber harvest and dispersed and developed recreation. Effects most commonly documented include loss of vegetative structural diversity, reductions in the amount and quality of dead and down material, alterations in storage and routing of water and sediment, and loss of vegetative ground cover. Forest-wide trends in aquatic condition are strongly influenced by riparian area conditions. These trends and factors influencing them are discussed in detail in Section B.4. Water and Section B.10.Fish.

8. Research Natural Areas (RNAs)

a. Background

The general reason for establishing Research Natural Areas is to increase human knowledge of the natural environment by providing for research and education in areas unmodified by human beings. All human activities in these areas are kept to the minimum so that natural ecological processes dominate. The RNA system establishes three specific purposes:

- Provide a baseline against which human activities can be monitored.
- Study the mechanisms of natural processes in undisturbed conditions.
- Preserve gene pools for organisms, especially those which are rare or endangered.

b. Existing RNA's

The Forest has three designated RNA's occupying 1,736 acres. They are Mill Creek, Bull Run, and Bagby. All three exist in a condition relatively undisturbed by human activities, and their RNA designation insures that they will

remain so. Only disturbances caused by natural forces will be allowed.

(1) *The Mill Creek RNA*: This area occupies 815 acres of forest/grassland in a transition zone east of the Cascade Crest. It was established in 1971 to permit the study of relationships between plants, wildlife, and other components of the environment in a mosaic of Oregon white oak, ponderosa pine, Douglas fir, and bunchgrass communities. This area has been used to study the distribution and role of conifer needle endophytes and plant classifications of the Grand Fir Zone and the Ponderosa Pine Zone.

(2) *The Bagby RNA*: This area, established in 1971, consists of two tracts of land in the Collawash River drainage totalling 560 acres. It is forested by stands of western hemlock and Douglas fir, typical of mid-elevations in the western Cascades, and it provides a site for study of various ecosystem processes in undisturbed conditions. Recent studies carried out in this area include:

- (a) Habitat type classification.
- (b) Vegetation classification of old-growth wildlife habitat.
- (c) Amount and role of coarse woody debris in northwestern conifer forest.
- (d) Distribution and role of conifer needle endophytes.

(3) *The Bull Run RNA*: This area, encompassing 361 acres, was established in 1966 to permit the study of forests in the transition zone between temperate and subalpine forests in the western Cascades. Within this area are mixed stands of western hemlock, Douglas fir, Pacific silver fir, and noble fir. It has recently been used for community classification of the Silver Fir Zone.

The total area of these existing RNA's is 1,736 acres.

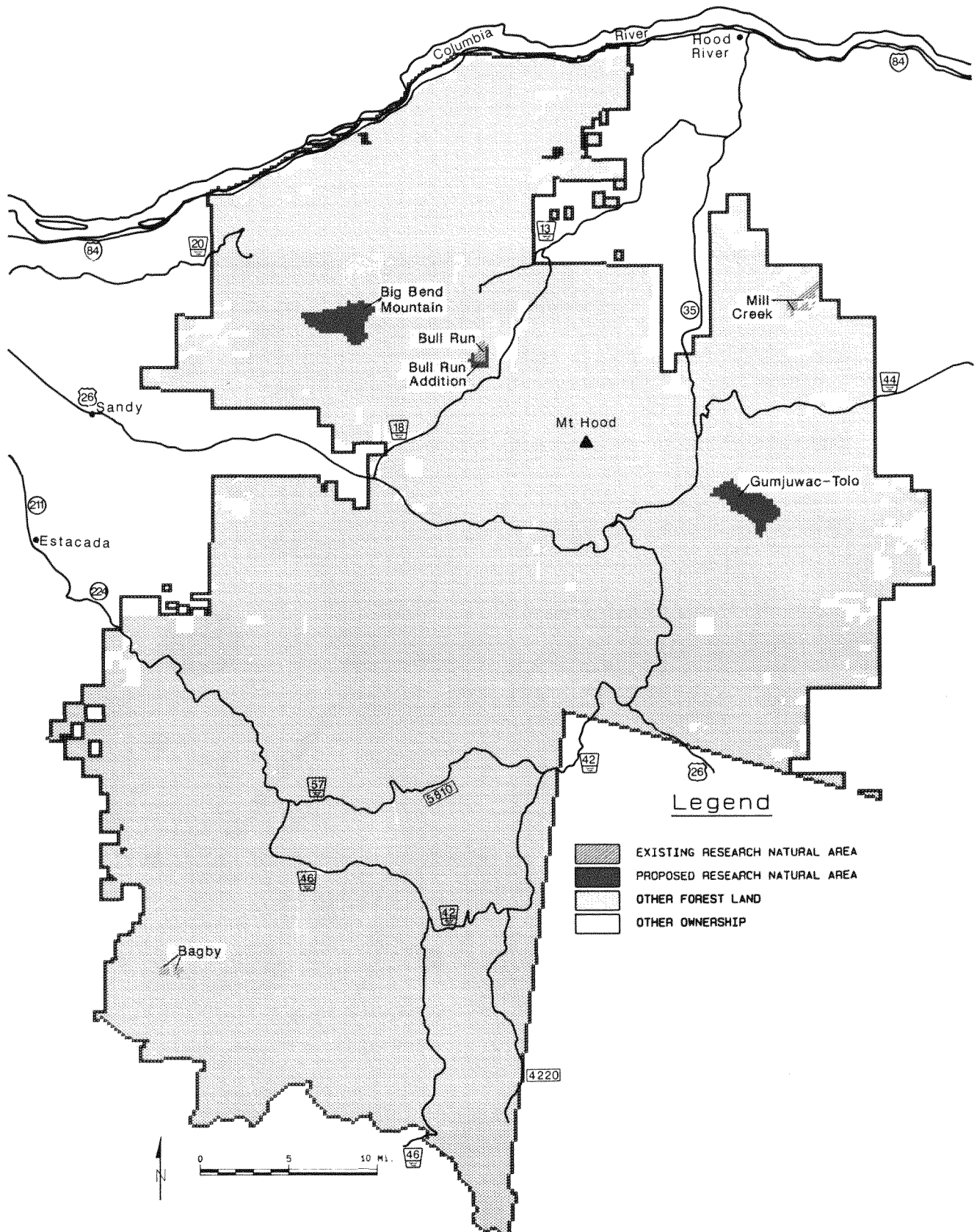
c. Potential RNA's

Each of the following potential additions was selected as a representative sample of ecosystems needed for study.

(1) *The Bull Run Addition*: This 400 acre site has been identified by the Forest for at least a decade. It would extend the south and east boundaries of the existing Bull Run RNA to the natural ridgeline that runs north and west from Hiyu Mountain. The current boundary does not follow a recognizable topographic feature and is very difficult to locate on the ground.

(2) *Big Bend Mountain RNA*: This 3,700 acre potential RNA also lies within the Bull Run Watershed and consists primarily of subalpine forests of Pacific silver fir, western hemlock, mountain hemlock, and Douglas fir. The proposal originated in the early 1970's in recognition of the unique research values on the upper part of Big Bend Mountain. Characteristics of the area include untouched subalpine forests, spring ponds, and a subalpine lake.

RESEARCH NATURAL AREAS



Adoption of a Big Bend Mountain RNA would improve the opportunity for research in subalpine ecosystems. There is great interest in this subject at present, and the Forest stands to gain much additional knowledge about management of these types of ecosystems. In addition, it may be possible to use the Fir Creek drainage as a baseline watershed.

(3) *Gumjuwac-Tolo RNA*: This 3,300 acre potential RNA is in the Badger Creek Wilderness. It represents a wide range of east side ecosystems including high-elevation forests of subalpine fir, Engelmann spruce, and western larch, mid-elevation forests of grand fir and Douglas fir, and low-elevation stands of ponderosa pine. Intact drainages in the Gumjuwac-Tolo RNA would afford excellent opportunities to study nutrient cycling and other natural processes in these environments. This potential RNA fills a need for research in mixed conifer forests. Because of the widespread repeated disturbance of most mixed conifer forests on the east side, it would be difficult, if not impossible, to find an area of comparable value.

A map accompanying this discussion identifies the locations of existing and potential RNA's. The total area of the three proposed additions is 7,400 acres.

d. Relationships to the Natural Environment

The designation of RNAs, by definition, provides maximum protection of natural processes and conditions. These areas are therefore compatible with the biophysical environment. If the environment of an RNA is disturbed, it will be due to purely natural events.

e. Relationships to the Human Environment

RNA designation of a site affects all major human activities that impact the environment. Activities that would disturb conditions in the RNA's are generally prohibited to permit research and study of natural systems. However, land allocated for RNA's can be used for activities which do not significantly disturb the area's natural condition. Watershed and wildlife values on established and potential RNA's should change little from their present condition. Back country hiking currently allowed in the potential Gumjuwac-Tolo RNA is not expected to compromise research values if continued at present levels.

As the amount of land involved in RNA's is small, their impact on the economy or lifestyles in the local communities is also minimal. Knowledge gained from RNA research may provide long range human benefits.

f. Management Concerns

The question has been raised whether a RNA designation in the Bull Run Watershed Management Unit, pursuant to Public Law 95-200, would prevent salvage or other activities considered essential to protect water quality.

Management activities of this nature may be needed after a catastrophe such as a wind storm. The concern appears unnecessary because regulations clearly state that management objectives in Congressionally-designated areas override RNA policies.

9. Sensitive Species of Plants

a. Background

Threatened or Endangered plant species are those listed by the U.S. Fish and Wildlife Service under the provisions of the Endangered Species Act of 1973. Under Forest Service policy, another category of species receives similar attention. The Regional Forester identifies sensitive plant species designated for special management consideration to prevent them from becoming threatened or endangered.

b. Existing Situation

There are no threatened or endangered plant species on the Forest at this time, and none are now foreseen. However, the locations of 48 sensitive plant species have been documented or tentatively identified as listed on the accompanying table. Due to the rarity of these plants, or their vulnerability to habitat disturbances, or both, any proposal that would potentially modify their habitat must be evaluated according to its impact on these species. Eleven sensitive species are currently under review for possible listing under the Endangered Species Act. The remainder of the list was obtained from a 1979 report prepared by the Oregon Rare and Endangered Plant Species Task Force, a cooperative effort of private and government personnel. This list is reviewed and updated annually, based on information maintained by the Oregon Natural Heritage Data Base.

Plants on this list include species of concern throughout their range of growth, plus those which may be more common elsewhere but are rare or threatened in Oregon. The sensitive plant list for the Forest is relatively long for a basic reason. The Forest includes both slopes of the Cascades with a very wide range of plant habitats, from very dry to very wet. Plant life is diversified accordingly. When species are at the northern or southern limits of their growing range, or otherwise very localized, they may be sufficiently rare or threatened to merit listing as sensitive. In the Columbia Gorge, for example, many species reach the limits of their range, and several species in the Gorge are found nowhere else on earth.

c. Relationships to the Natural Environment

Sensitive plants grow in all parts of the Forest, on all Ranger Districts, and in a wide variety of habitats. However, not all habitats and areas support equal proportions of sensitive species. Wet habitats, as might be expected, support the most species. Open ridges, cliffs, and

Table III-2

Sensitive Plant Species

*	SENSITIVE PLANT SPECIES	RANGER DISTRICT						
	<i>Agoseris elata</i>	B	BS	CL	CG	E	HR	ZZ
	<i>Agrostis howellii</i>				CG		HR	
	<i>Allium campanulatum</i>	B	BS				HR	
	<i>Arabis furcata</i>	B	BS	CL	CG		HR	ZZ
	<i>Arabis sparsiflora</i> var. <i>attrorubens</i>	B			CG		HR	
X	<i>Aster gormanii</i>		BS	CL		E		ZZ
	<i>Astragalus howellii</i> v. <i>howellii</i>	B						
X	<i>Astragalus tyghensis</i>	B						
	<i>Bolandra oregana</i>				CG		HR	
	<i>Botrychium boreale</i>	B	BS	CL	CG	E	HR	ZZ
	<i>Botrychium lanceolatum</i>	B	BS	CL	CG	E	HR	ZZ
	<i>Botrychium lunaria</i>	B	BS	CL	CG	E	HR	ZZ
	<i>Botrychium simplex</i>	B	BS	CL	CG	E	HR	ZZ
	<i>Calamagrostis breveri</i>	B	BS	CL	CG		HR	ZZ
X	<i>Calochortus longebarbatus</i> var. <i>longebarbatus</i>	B	BS				HR	
	<i>Campanula scabrella</i>			CL		E		
	<i>Carex macrochaeta</i>				CG		HR	
X	<i>Castilleja levisecta</i>				CG			
	<i>Corallorhiza trifida</i>	B	BS	CL	CG	E	HR	ZZ
X	<i>Corydalis aquae-gelidae</i>		BS	CL	CG	E		ZZ
	<i>Draba aureola</i>		BS	CL	CG	E	HR	ZZ
	<i>Erigeron canadensis</i>			CL		E		
X	<i>Erigeron howellii</i>				CG		HR	
	<i>Erigeron oregonus</i>				CG		HR	
	<i>Fritillaria camschatcensis</i>				CG			ZZ
	<i>Hieracium longiberbe</i>				CG		HR	
X	<i>Howellia aquatilis</i>				CG		HR	
	<i>Lewisia columbiana</i> var. <i>columbiana</i>	B			CG		HR	
	<i>Lomatium farinosum</i> v. <i>hambleniae</i>	B					HR	
X	<i>Lomatium laevigatum</i>				CG		HR	
	<i>Lomatium watsonii</i>	B					HR	
	<i>Lycopodium annotinum</i>	B	BS	CL	CG	E	HR	ZZ
	<i>Lycopodium complanatum</i>	B	BS	CL	CG	E	HR	ZZ
	<i>Lycopodium inundatum</i>	B	BS	CL	CG	E	HR	ZZ
	<i>Lycopodium selago</i>	B	BS	CL	CG	E	HR	ZZ
	<i>Ophioglossum vulgatum</i>	B	BS	CL	CG	E	HR	ZZ
X	<i>Penstemon barrettiae</i>	B	BS	CL	CG	E	HR	ZZ
	<i>Phlox hendersonii</i>	B	BS	CL	CG	E	HR	ZZ
	<i>Poa maritima</i>				CG		HR	ZZ
	<i>Potentilla villosa</i> var. <i>parviflora</i>				CG		HR	ZZ
	<i>Ranunculus recurvatus</i>	B					HR	
X	<i>Rorippa columbiana</i>				CG		HR	
	<i>Salix bebbiana</i>	B						
	<i>Scribneria bolanderi</i>	B					HR	
	<i>Streptopus streptopoides</i>				CG			ZZ
	<i>Suksdorfia violacea</i>				CG		HR	
X	<i>Sullivantia oregana</i>				CG		HR	
	<i>Tauschia stricklandii</i>				CG		HR	

*An "X" in left column indicates the plant is being considered for T&E status.

other rocky sites support a lesser number. Comparatively more sensitive species are to be found in the Columbia Gorge, on Mt. Hood, and on the drier east side of the Forest than are located in other areas.

Sensitive plants, like threatened and endangered species in general, may serve as indicators of the well-being of their environment. Extensive habitat alterations may cause declines in their populations and thereby signal more subtle changes of the natural setting. In different circumstances, species may be rare because they have not adapted to a relatively limited or localized habitat, and management activities do not particularly threaten their survival. Nevertheless, with low numbers and limited range, their apparent vulnerability to environmental changes indicates the need for monitoring their population trends. Species growing in the spray of waterfalls in the Columbia Gorge illustrate the need.

Some species are particularly susceptible to adverse effects from environmental changes due to their habitats and their vulnerability to changes in those habitats. Kruhsea, a member of the lily family found only in Oregon in the Bull Run Watershed, is an example. This plant seems to find its optimum habitat to be well-rotted logs in old growth forests.

It seems to decline following logging or similar disturbances. Other species may have evolved with some form of natural disturbance like fire. These species may benefit from timber harvest, and could be threatened by fire suppression. The implication is that caution and consideration are required in weighing the environmental qualities needed by sensitive species. Absolute protection may not always be desirable.

d. Relationships to the Human Environment

Timber harvesting and road building affect sensitive plant species. Measures to protect sensitive plant species, including the possibility of dropping a project, could significantly restrict otherwise desirable logging and road building. This principle applies to any other activity with ground-disturbing results. Fortunately, many sensitive plants grow in areas where neither timber harvesting nor other disturbing activities are scheduled.

(1) *Water Quality.* Since the kusea grows in the Bull Run Watershed, its protection could impact management for water quality. However, water quality comes first in watershed management so that protecting this or any other sensitive plant would become secondary.

(2) *Cattle Grazing.* Although the number of cattle grazing on the Forest is very small, the effects of grazing on sensitive plant species needs more study. Some plants, such as the Mountain Lady Slipper, are known to be adversely affected by grazing, and one plant on the list, the long-bearded mariposa lily, is susceptible to elimination by grazing.

(3) *Other Human Concerns.* The protection of threatened/endangered or sensitive plant species may require modifying or eliminating some forest projects with negative impact on nearby communities. The boundaries of cutting units, or logging methods, may be changed. Such changes must be weighed in terms of the continued existence of plants considered valuable in terms other than money. Sensitive plants interest both professional and amateur naturalists.

e. Management Concerns

Management direction of the Forest is affected by various requirements for the protection of threatened, endangered, or sensitive species. Knowledge of the status of plant populations on the Forest is expected to increase with resulting changes in the numbers and locations of plants to be protected. As human activities on the Forest increase, the number of species to be listed is likely to increase, not decline.

Forest Service policy is in general the maintenance of viable populations of all native plants and animals found on national forests. To implement this policy, Mt. Hood management adopted in 1981 an interim plan pending

adoption of the Forest Plan. The objective of the interim plan is identical with the just cited Forest Service objective and includes a procedure called Biological Evaluation. The five steps in the procedure, as follows, are to be used in evaluating projects and activities for any possible impact on sensitive species.

- Check records for evidence that a sensitive species or likely habitat may be located in the area of the proposed project in question.
- Check out the site with trained personnel to see if sensitive species are physically present.
- If sensitive species are located, evaluate the controlling factors: the populations of the species, the quantity of individual plants on the site, and the timing of the project in relation to the species' habitat needs. If the project will change the habitat, a conflict is presumed to exist. If a modification of the project will eliminate the conflict, the project may proceed following modification.
- If the project cannot readily be modified or dropped, the effects of the project on the species will receive additional analysis. Example: the project could wipe out the entire population of the species. The effect would be clearly significant. If, on the other hand, the project harmed or eliminated a few individual plants in an area where many others were growing vigorously and reproducing successfully, the effect would be considered insignificant.
- If data are insufficient to determine the significance of the proposal's effects on the species' population, a biological/botanical investigation would proceed. This in-depth look at the species would determine if the project would contribute to the species becoming threatened or endangered.
- If a management decision is reached at any stage of this five-step procedure so that the project is authorized to proceed, reasons for the decision must be fully documented in the Environmental Assessment (EA), or Environmental Impact Statement (EIS).

Protection of many plant species alone will not be sufficient. Plans for regular monitoring of population trends have been adopted to identify any species which may require altering or managing their sites to enhance their growth. Relocating plants to another site will be considered only as a last resort.

To assure the achievement of all objectives, and as wide a distribution of sensitive plant populations as possible, the Forest will develop Species Management Guides for species which may frequently conflict with projects. Candidates for federal listing as threatened or endangered, or those which have all or most of their populations on the

Forest, will receive highest priorities. A general goal of the Guides will be to establish target populations which assure genetic diversity.

10. Fish

a. Background

The demand for fish from waters of the Pacific Northwest far exceeds the supply. The Mt. Hood National Forest is one of eight Oregon and Washington National Forests, within the Columbia River basin, which continues to provide substantial habitat for salmon and steelhead trout production. The Forest makes major contributions to Columbia River fish supplies, both wild and hatchery spawned. With its great diversity of aquatic habitats, ranging from alpine lakes to reservoirs and backwaters of the Columbia River, the Forest provides habitat for at least 48 known species of fish. The most culturally important species to the region are those of the salmonid family, or trout and salmon. These include both anadromous and resident fish. Anadromous fish spawn and hatch in fresh water where they normally remain one to two years, depending on each species' genetic inheritance. Young anadromous fish smolt then swim to the ocean where they grow to maturity. The cycle is complete when the fully grown fish return to their freshwater birthplace to spawn. Coho and chinook salmon and steelhead trout are the most abundant anadromous salmonid on the Forest. Resident fish complete their entire life cycle in fresh water. Rainbow trout and cutthroat trout are the most abundant of these.

Long-term fisheries production depends on the Forest to provide spawning and rearing habitat, as well as a quality source of fresh water for downstream fisheries and fish hatchery use. Maintenance of fish habitat and water quality is a major concern for the public, State and Federal natural resource agencies and members of The Confederated Tribes of The Warm Springs.

b. Resource Characteristics

(1) Aquatic Habitat. Current stream surveys indicate that more than 1,600 miles of the Forest's streams support fish. More than 300 miles of those streams support anadromous salmon and steelhead trout. Another 500 miles of streams have habitats suitable for anadromous fish, but natural or man-made barriers prevent migration. It is estimated that about half of this blocked habitat could be made accessible. Roughly 140 miles of the Forest's stream habitats alone could be opened to anadromous fish production if passage were provided at a series of falls on the White River, a tributary to the Deschutes River (USDE Bonneville Power Administration, 1985).

About 100 lakes and reservoirs within the Forest provide habitats for salmonids, primarily resident trout. A total of approximately 4,000 surface acres of habitat exists. Major

lakes include Lost, Olallie, Monon, and Bull Run. Major reservoirs are Timothy, Laurence, Clear, and Bull Run. Warm water game fish are found in a number of the Forest's ponds and in the Columbia River and its backwaters within the Columbia Gorge. Timothy Lake reservoir supports a major commercial and recreational fishery for crawfish.

For planning and management of aquatic habitats, it is important to understand their capability to produce fish under varying sets of conditions. For both resident trout and anadromous species, such estimates of habitat capability have been made using indices. The estimator for trout is called The Legal Trout Index (L.T.I.); for anadromous fish, it is The Smolt Habitat Capability Index (S.H.C.I.). A smolt is a juvenile anadromous fish ready to migrate to the sea. Habitat capability estimates assume all available habitats are fully occupied. They estimate the number of legal trout or smolts which could be produced on an annual basis. The capability of an aquatic habitat to produce fish is determined by both the quantity and quality, or condition, of that habitat. Habitat condition is assessed by comparing how well a species', or group of species', life history requirements are met by existing or proposed water quality and physical habitat features. Aquatic habitat conditions on the Forest are closely associated with the condition of the riparian areas because of their influence on water quality and physical habitat features.

(2) *Resident Trout.* A variety of resident trout species are found on the Forest as listed in Table III-3. Rainbow and cutthroat trout are most common in the streams and rivers. Rainbow and Eastern brook trout are most common in lakes and reservoirs. Wild, self-sustaining populations of resident trout are found in most streams and in roughly 30-50 percent of the lakes and reservoirs. A unique stock of wild rainbow trout has been identified in streams throughout the White River system (USDE Bonneville Power Administration, 1985). An unusual population of native bull trout (often called Dolly Varden) occur in Clear Branch Creek of the Hood River system (personal communication Jim Newton, District Biologist, Oregon Department of Fish and Wildlife ODFW). In areas with heavy fishing pressure, trout populations are often supplemented by periodic stocking with hatchery-produced trout. This stocking is done by the Oregon Department of Fish and Wildlife (ODFW). Popular streams, which are stocked with legal-sized trout, include the Clackamas River, Collawash River, Sandy River, Salmon River, Hood River, and the White River. Most reservoirs and many of the Forest's lakes are also stocked with fingerling or legal trout. A majority of these lakes are found within wilderness or currently designated scenic or special interest areas.

Table III-3

Salmonids found on the Forest

RESIDENT SPECIES	ANADROMOUS SPECIES
Rainbow Trout (<i>Salmo gairdneri</i>)	Winter and Summer run Steelhead (<i>Salmo gairdneri</i>)
Golden Trout (<i>Salmo aquabonita</i>)	Searun Cutthroat Trout (<i>Salmo clarki</i>)
Cutthroat Trout (<i>Salmo clarki</i>)	Fall and Spring run Chinook Salmon (<i>Oncorhynchus tshawytscha</i>)
Eastern Brook Trout (<i>Salvelinus fontinalis</i>)	Early and Late run Coho salmon (<i>Oncorhynchus kisutch</i>)
Brown Trout (<i>Salmo trutta</i>)	
Dolly Varden (<i>Salvelinus malinus</i>)	
Mountain Whitefish (<i>Prosopium williamsoni</i>)	

Table III-4

Habitat Types and Capability Indices

HABITAT	TOTAL HABITAT	SPECIES	HABITAT CAPABILITY INDEX POTENTIAL LEVEL
Streams	304 mi	Steelhead Trout	Smolts 463,700
	235 mi	Coho	Smolts 768,300
	141 mi	Spring Chinook	Smolts 982,400
	4 mi	Fall Chinook	Smolts 152,000
	304 mi*	Searun Cutthroat	Smolts 256,000
Streams	1650 mi	Resident Trout	Legals 599,300
Lakes	1400 ac	Resident Trout	Legals 741,400
Reservoirs	1900 ac	Resident Trout	Legals 171,000

Source: Mt. Hood National Forest Habitat Capability Index (1985) and Legal Trout Habitat Capability Index (1985).

Probable historic range; current runs appear to be severely depressed.

The potential production index for legal trout, from all currently occupied habitat, is listed in Table III-4. According to current estimates, about 70 percent of the annual production capability is associated with stream habitats, the remainder from lakes and reservoirs. Roughly 50-60 percent of the trout fishing, however, currently occurs in lakes and reservoirs.

(3) *Anadromous Fish.* Four species of anadromous fish, as listed in Table III-5, use the Forest's stream habitats for spawning and rearing. These include: steelhead trout (summer and winter runs), searun cutthroat trout, chinook salmon, (spring and fall runs), and coho salmon (early and late runs). All major stream systems of the Forest, except White River, support annual runs of one or more of these species. The Clackamas River is the heaviest producer of anadromous fish on the Forest. It provides 142 miles of habitat (about 50 percent of the Forest total) and supports all anadromous species, except fall chinook salmon, on the Forest. It is followed by the Sandy River, Hood River,

and Fifteenmile Creek watersheds in terms of total anadromous production.

A number of other wild runs of anadromous fish deserve attention. These fish are believed original stocks which have adapted over long periods of time to specific conditions within the watershed where they return generation after generation. To recognize their importance, the Oregon Department of Fish and Wildlife (ODFW) has developed a Wild Fish Management Policy. Wild stock of salmon and/or steelhead occur in all of the Forest's major watersheds. The wild late run coho salmon in the Clackamas River and winter steelhead in Fifteenmile Creek are especially noteworthy. The former represents the last wild runs of coho fish in the lower Columbia River in Oregon. The latter is the eastern-most run of wild winter steelhead in Oregon (Sub-basin Anadromous Fish Production summaries, 1986, The Northwest Power Planning council Production Planning workshops-draft). Preliminary observations indicate that a remnant of the Sandy River wild spring chinook stock continues to reproduce on the Forest in Still Creek and the Salmon River.

The potential annual production index of anadromous fish, from all currently utilized habitat, is listed by species in Table III-4. In some cases, the index of Forest habitat capability is greater than existing observed production. The difference is largely a result of too few fish returning to fully use all available habitat. Numerous efforts, including the Northwest Power Planning Council's Columbia River Basin Fish and Wildlife program, and the US-Canada fishing treaties are aimed at increasing anadromous production from the Columbia River Basin.

In addition to anadromous production from the Forest's stream habitats, five major fish hatcheries are located on or adjacent to the Forest. All five hatcheries obtain all or most of their water supplies from the Forest's watersheds. These watersheds are shown on the map with municipal supply watersheds in the preceding section on water.

Table III-5

Annual Average Production of Anadromous Fish from Hatcheries Deriving a Water Supply from Mt. Hood National Forest Watersheds

NAME/AGENCY	WATERSHED	SPECIES	AVG. ANNUAL OUTPUT
Clackamas/ODFW 1 million lbs.	Clackamas ^{1/}		Spring Chinook
Eagle Cr./USFWS	Eagle Cr.	Spring Chinook, Coho, Steelhead	.7 million lbs.
Sandy/ODFW	Cedar Cr.	Coho	1 million lbs.
Bonneville/ODFW	Tanner Cr.	Fall Chinook	11.5 million lbs.
Cascade/ODFW	Eagle Cr.	Coho	2 million lbs.
Oxbow/ODFW	Herman Cr.	Fall Chinook	4 million lbs.

^{1/} A substantial portion of hatchery water supply also provided by wells located at the facility.

Table III-7 summarizes average yearly production of anadromous fish from hatcheries using Forest water.

c. Relationship to the Natural Environment

Fish species found on the Forest do not adversely impact the natural environment; in fact, their presence in water is normally an indication of good water quality. However, the natural environment, especially that of riparian areas, does have extremely important effects on the numbers and species of available fish.

Salmonids need cool, clean running water and an adequate food supply. They need clean gravel beds for spawning. Warm-water game fish tolerate warmer waters than do the salmonids. Warm, quiet ponds and small lakes make ideal habitats for these species. Any change in fish habitats, naturally caused or otherwise, will affect fish populations one way or another. Salmonids in particular are extremely sensitive to changes in habitat and water quality. The ranges are so narrow that any extreme change is generally lethal. Fish are also sensitive to suspended and bed load sediment; if spawning beds are covered with silt, deposited fish eggs will die, or fry are unable to emerge from the gravel. *Habitat Requirements of Anadromous Salmonids*, 1979 provides an excellent review of physical and biological conditions necessary for the survival of these fish. Major factors which can cause changes to key habitat components (e.g. water quality, quantity and temperature, holding, spawning and rearing habitat, et.al.) are: removal of riparian vegetation; physical modification of stream channels, including large woody material; disturbances and erosion of soils; and the introduction of toxic materials. Examples of these materials include gas, oil, and chemicals used to control vegetation and insects.

Because of their relative sensitivity to change, the salmonids have been selected as "an indicator species group" for aquatic habitats. This group of species is especially important for their commercial and game values, and because they occupy the spectrum of aquatic habitats on the Forest.

d. Relationship to the Human Environment

Salmonids are an economic and cultural factor of life in the Pacific Northwest. From Pre-Columbian times to now, these fish have occupied a significant part of the lives of many different kinds of people, including Native American tribes, sport fishermen, commercial fishermen, and everyday people who simply enjoy watching graceful fish movements in clean waters. As fisheries have dwindled, their importance has been made clear by the vigorous disagreements over who is entitled to utilize this resource.

Another indication of the importance of the Forest's fish resource is that more than 85 percent of the Forest's developed recreation sites are near water -- streams, river, lakes, or reservoirs. Fishing is a highly popular activity among recreationists using these sites. Many residents of

the Portland-Vancouver Metropolitan area are attracted to the Forest's lakes and streams and look upon them as a vital component of the area's lifestyle.

Fish, both resident and anadromous species supported by Forest habitats, make substantial economic contributions. These are generated primarily from recreational and commercial harvest of the fish. Financial values from existing habitats are estimated at about three million dollars per year for anadromous fish harvest and about one million dollars per year for resident trout harvest.^{1/} Anadromous fish at five major hatcheries provide additional values. These hatcheries rely upon high-quality water from Forest watersheds.

If the condition of the Forest's fish habitats are allowed to continue to decline the adverse impact upon the communities near the Forest will be large. The Native American tribes would be among the most adversely impacted, for they depend on anadromous fishing not only to earn a living, but also for their cultural well-being.

The maintenance of aquatic habitats will impact human use of other Forest resources. Program activities such as timber harvest and livestock grazing can directly or indirectly alter riparian and aquatic habitat conditions. Table III-6 summarizes current resource program activities and their potential associated effects on aquatic habitat.

Table III-6

Resource Program Activities and Associated Effects on Riparian and Aquatic Habitats

RESOURCE PROGRAM	RIPARIAN AND AQUATIC HABITAT CONDITIONS AFFECTED
<u>Timber Harvest and Road Construction</u>	Cover/Shade Vegetation Removal Accelerated Sedimentation Reduction in Watershed Stability Large Woody Debris Removal
<u>Special Uses:</u> (Small Hydroelectric, Municipal Water, Transportation Corridors)	Flow/Aquatic Habitat Reduction Reduced Fish Passage Water Quality Changes Accelerated Sedimentation Riparian Vegetation Removal Streamside Alterations
<u>Developed Recreation and Summer Homes</u>	Cover/Shade Vegetation Removal Harassment/Overharvest Accelerated Sedimentation Streamside Alterations
<u>Motorized Dispersed Recreation</u>	Cover/Shade Vegetation Removal Streamside Alterations Harassment Sediment
<u>Grazing</u>	Cover/Shade Vegetation Removal Bank Stability Accelerated Sedimentation
<u>Non-Motorized Dispersed Recreation</u>	Cover/Shade Vegetation Removal Streamside Alterations
<u>Domestic Water Use</u>	Flow/Aquatic habitat Reduction
<u>Wildlife, Scenic or Special Interest Areas Management, Wilderness</u>	Restoration/Improvement/ Maintenance Riparian and Aquatic Habitat

^{1/} Based upon SHCI and LTI estimates, existing harvest and success rates, and U.S.F.S. values for Region 6 for recreation and commercial fishing.

As the preceding discussion suggests, Forest management activities or natural events which substantially alter riparian areas have an effect on fish habitats. The net effect has been reduction in fish habitat capability resulting from a change in the diversity or complexity of aquatic habitats (ODFW, 1985). The compatibility of different Forest activities with the maintenance of fish habitat include such factors as: the degree of soil/vegetation disturbance, the size and location of the affected areas, and the frequency and duration of the disturbing activity.

e. Summary of the Current Situation

The maintenance, restoration, and enhancement of fish habitats and water quality on the Forest are issues of considerable concern to the public, State and federal natural resource agencies, representatives of The Confederated Tribes of the Warm Springs, and Forest management staff. The unmet demand for fish resources, and the precarious state of many Columbia River runs of anadromous fish, makes the coordination of activities of all concerned parties essential. This need is reflected in management partnerships entered into by memorandum of understanding between the Forest Service and various agencies and groups including ODFW.

Close coordination with the Confederated Tribes of the Warm Springs also occurs especially for areas east of the Cascade crest which involve lands ceded by the Tribes.

Current Forest management is derived from laws, regulations, and policies, in relation to water, fish, wildlife, and riparian ecosystems. Professionals provide advice concerning protection of fish, wildlife, and water when plans for resource management are being considered. Trade-offs, involving costs or availability of resources, are often required. Such trade-offs are currently considered only on a project basis.

In previous planning efforts, when the Forest's production targets for programs such as timber management were set, the nature and magnitude of the trade-offs needed to protect aquatic and riparian resources were not fully addressed. Managers did not have the benefit of resource data and analysis procedures that are currently available. Today, informed management of riparian areas and the resources such as fish and water which depend upon them, is increasingly necessary.

The need for more comprehensive riparian resource management is further amplified by the general downward trend in riparian and aquatic habitat conditions noted previously in this chapter (see Section B.4. Water and Section B.7. Riparian Areas). This trend is reflected by altered channel conditions. These include: loss of in-stream structure; loss of channel length due to straightening; loss of "special" off-channel habitats, such as side-channels and ponds, due to straightening, filling and downcutting and in-

creased summer stream temperatures associated with vegetation removal and channel widening. In addition, timber harvest and road construction in the upland portions of many watersheds has increased the risk, both in terms of frequency and magnitude, of "rain on snow" flood events. Riparian areas that have been stressed by management activities are less capable of mitigating the effects of such flood events.

This trend in riparian and aquatic habitat condition has reduced Forest-wide fish habitat production capability. This has occurred by decreasing the quantity of suitable habitat and reducing the quality of available spawning and rearing habitat. As noted in Section B.4. Water, existing watershed conditions and trends suggest that the potential for future reductions in fish production capability is relatively high given another major flood event.

An intensive study in Fish Creek, a tributary to the Clackamas River, has begun to provide quantitative descriptions of trends in aquatic habitat condition over the last 20 to 30 years. The quantity of accessible anadromous habitat has been reduced by an estimated 20-25 percent (personal communication with D. Hahler, District Biologist). Contributing factors include blocked access at tributary road crossings and reduced channel length due to downcutting and straightening. Reductions in the quality of available rearing habitat are reflected by: a more than 30% reduction in low flow pool habitat; an 8-10°F increase in summer maximum stream temperatures; and, wide-spread reductions in hiding cover and general habitat diversity associated with an estimated 90% decrease in large woody debris materials.

Although Fish Creek is not necessarily representative of all streams on the Forest, it reflects general conditions which are widely represented. The degree and magnitude of changes, in aquatic habitat condition, appear to be most closely related to the frequency, degree and extent of past management activities.

Springs, and Forest management staff. The unmet demand for fish resources, and the precarious state of many Columbia River runs of anadromous fish, makes the coordination of activities of all concerned parties essential. This need is reflected in management partnerships entered into by memorandum of understanding between the Forest Service and various agencies and groups including ODFW.^{1/} Based upon SHCI and LTI estimates, existing harvest and success rates, and U.S.F.S. values for Region 6 for recreation and commercial fishing.

The rehabilitation and enhancement of aquatic habitats degraded by man or natural events could increase the Forest's production of anadromous and resident fish in substantial numbers. The investment required to carry out the total fish rehabilitation/enhancement program developed by the Forest is estimated at \$10 to \$20 million and would require at least 10 to 20 years for full implementation. It

focuses primarily on improving or restoring the diversity of pools and riffles needed to nurse juvenile anadromous fish until they reach the smolt stage and on providing adult passage to areas of habitat which are currently inaccessible.

Table III-7 permits comparison of present production with projected increases that would result from a program with full enhancement.

Local fishing demands for resident trout are also large and are likely to increase. Data are limited, but current demand appears to be met by the supply from Forest lakes and reservoirs. Demand for stream fishing is far below available opportunities at this time.

If demand for trout fishing increases in proportion to the increases in surrounding-area populations, the total supply will remain out of balance unless one or more of the following steps are taken:

- Increase habitat capability through enhancement.
- Increase the stocking of planted fish.
- Enact special regulations.
- Encourage increased use of less-accessible streams.

Residents of the nearby Portland metropolitan area and other nearby communities continue to express increased interest in habitat maintenance, rehabilitation, and enhancement. This represents a Forest management opportunity whereas fish planting and the enactment of new fishing regulations are responsibilities of the Oregon Department of Fish and Wildlife. A Forest-wide program to restore and improve habitat for resident trout is estimated to provide for substantial increases in the ability of the habitat to produce legal trout. It is similar to that described for anadromous fish except that fish passage work would be a relatively minor component. Increases estimated to result from full implementation of this program are shown in Table III-7.

Table III-7

Habitat Types and Capability Indices with Full Enhancement

HABITAT	UNITS	SPECIES BENEFITED	HABITAT CAPABILITY INDEX ^{1/}	
			WITH FULL ENHANCEMENT	% CHANGE
Streams	527 Miles	Steelhead	Smolts ^{2/} 813,700	75
	311 Miles	Coho	Smolts 1,163,300	51
	256 Miles	Spring Chinook	Smolts 1,342,700	37
	5 Miles	Fall Chinook	Smolts 227,000	49
	413 Miles	Searun Cutthroat	Smolts 393,700	54
Streams	1650 Miles	Resident Trout	Legals ^{3/} 756,900	26
Lakes	1500 Miles	Resident Trout	Legals 85,600	16
Reservoirs	1900 Acres	Resident Trout	Legals 196,600	15

^{1/} Source: Mt. Hood National Forest Capability Index (1985) and Legal Trout Capability Index (1985).

^{2/} Smolt is a juvenile anadromous fish physiologically prepared to migrate from freshwater and make the transition into a salt water environment.

^{3/} Legal fish is a fish of length to be legally caught under Oregon Fishing Regulations.

II. Wildlife

a. Background

To many people, the sounds and sights of wildlife are a vital part of the Forest's environment. Without them, it would be incomplete. Therefore, the maintenance of animal habitats sufficient in quantity, quality, and distribution to support a variety of species is a concern of both the Forest's management and its users. Some species of wildlife, such as the spotted owl, are special causes of concern due to the risk that their populations may decline if their habitats decline.

b. Existing Situation

(1) *Types of Habitats.* In simplest terms, an animal's habitat is the area in which it lives. The habitat components essential for an animal to survive are food, water, and shelter. The proportions and relative abundance of these essentials indicate the capability and diversity of the habitat. Capability and diversity, in turn, indicate the ability of a given area to support populations of wildlife. Types of wildlife habitats on the Forest are highly diversified. The east side of the Forest has types of habitats and species of animals unique to its environment. Other types of habitats and animal species are unique to the west side. Elevation also adds diversity. The condition of Forest areas in terms of the age-class of their trees (i.e. how old they are) adds yet another dimension to the diversity of their inhabitant species. In classifying wildlife habitats, the age-class of a stand of trees describes growth from its beginnings in nonforested land, or a recently cleared forest opening, to stands of old growth hundreds of years old. The age of trees does not affect the quality of wildlife habitats as much as the total characteristics of the stand. A forest with a variety of well-distributed age-classes of stands is considered near optimum in wildlife habitat. Figure III-3 and Table III-8 accompanying this discussion illustrate some major differences in stand conditions.

A variety of well distributed age-classes cannot be achieved without skillful management of a forest's life cycle. The two most important stages of the cycle are its beginning and end. The beginning is critical because the amount and distribution of each species of trees in this stage determine the pattern of age-classes that will persist throughout the cycle, and in particular to the old-growth stage. This final stage is important because many species of animals require well distributed old growth (trees 200 years or older). Under present silvicultural practices, however, managed stands would never reach old-growth status following initial harvest.

If management miscalculates in identifying the amount and distribution of old growth, the resulting problem could take more than two centuries to correct.

The grass/forb and shrub-dominated stages of forest growth provide grazing and browsing animals with large quantities of forage. Without such food, they could not survive. At the same time, this class of wildlife requires mature and old growth for hiding and weather protection. Other species of wildlife also require mature and old-growth communities for food and cover. The relative sizes and distribution of various types of habitats are summarized in the following table and sketch.

Figure III-3

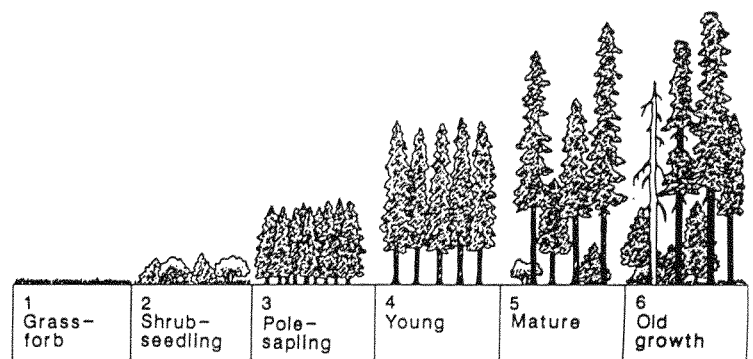


Table III-8

Acres of Wildlife Habitat Types (by Age Class)

WILDLIFE HABITAT TYPES BY AGE CLASS	ACRES OCCUPIED (x 1000)
(GF) Grass/Forbs (herbs)	41.7
(SD) Shrub dominated	66.4
(PS) Pole/Sapling	204.4
(YF) Young forest	75.2
(MF) Mature forest	249.4
(OG) Old growth	346.4
(NF) Nonforested	75.9

1/Old growth can be Defined in many ways. Probably the simplest definition of old growth is: any stand of trees equal to or greater than 200 years of age. Based on this definition, it is concluded that about 346,000 acres of old growth currently exist on the Forest. Of this, about 261,000 acres are in the tentatively suitable land base. The other 80,000 acres are in existing Wilderness or other areas which are unsuitable for timber management.

(2) **Quality, Quantity and Distribution of Habitats.** The total acreage of any given age-class habitat is one measurement of its wildlife capacity. Another measurement is the quantity and distribution of the habitat. Distribution of age-class is essential to a high-quality wildlife habitat. For example, old growth is essential to many animals, as previously noted. However, as happened in many forests, high-quality old growth has been easily accessible, and therefore it has been first to be harvested. Although the Forest still has high-quality old-growth habitats, the trend to harvest these stands continues.

A mixture of different age-classes provides better habitat diversity than a large, homogeneous area of only one age-class. For instance, deer and elk live on grass and forbs which grow in open spaces, but they use old growth for hiding and protection against severe heat and cold; these are two different age-classes. The principle of habitat diversity applies with equal force to other species. One key to wildlife habitat management is to provide a variety of age-classes in relatively small areas. Another key to good wildlife habitat management is to provide a variety of habitat sizes, e.g. 40 acres, 160 acres, 600 acres etc. This variety in habitat sizes will provide for the variability in a species home range needs, e.g. 160 acres for a pine marten; 300 acres for a pileated woodpecker. This need can be seen in Table III-10 of this section which summarizes habitat types by indicator species.

Two drainages and their habitat problems offer good examples of undesirable conditions. Both the Fish Creek and East Fork Hood River drainages have been extensively harvested and now contain large expanses of sapling-size timber. They do not provide a desirable mixture of wildlife habitats because they lack hiding and thermal cover. Because cover is not available, animals do not come to eat the generous amounts of browse growing in the areas. When the stands mature, cover will become abundant. But then the cover will shade out grass and forbs, and once again habitat diversity will be far below optimum. Silvicultural techniques, such as harvesting trees in small clearcuts, can remedy this problem by providing a mixture of forage and cover over a period of many years.

Although various timber-management techniques can correct distribution problems in grass/forb and other young-stand habitats, the problems of distribution of old growth are far from easily solved. Old growth takes a long time to replace so that inadequate distribution of this habitat has no short-term solution. At this time, stands of old-growth timber occupy about one-third of the Forest, but the quality and distribution of these stands vary greatly from drainage to drainage.

(3) *Special habitats.* The Forest provides a number of special wildlife habitats which contribute to the diversification of animal species. Riparian habitats are used by more species of animals than any other special habitat on the

Forest, no doubt because these habitats provide an abundance of food, water, and cover. They also serve as corridors for the travels of wide-ranging animals like elk and deer.

Pine-oak habitat in the Ponderosa Pine Zone runs as a discontinuous band along the dry, eastern edge of the mixed conifer forests on the east side. This special habitat occupies about 2% of the Forest, but its large oaks and old growth ponderosa pines provide food and cover for silver grey squirrels and Merriams turkeys. The habitat's old growth also provides the squirrels with nesting places and the turkeys with roosting habitat.

Snags and downed woody material resulting from the growth and death cycle of trees provide a third kind of special habitat. A number of birds and small mammals find roosting and nesting sites, and food in snags. Some species excavate cavities in snags, and a variety of cavity-nesting birds make these cavities into their homes. Such birds are especially sensitive to changes in supplies of suitable snag habitats. According to some authorities, a lack of snags can reduce the population of cavity-nesting birds.

A special and substantial habitat diversity can be found in downed large trees, such as a blown-down Douglas fir. The trunk is a restaurant for woodpeckers. The limbs are lookouts for rodents and rest areas for birds. A variety of creatures find sanctuary under the log, and the root wad is a dusting place for grouse. As the years take their toll, the bark loosens and Pacific tree frogs take up residency. Year after year, the slowly deteriorating trunk may develop fungus for mice to feed on, grubs for a hungry bear, and possibly a den for a coyote family.

Three other special habitats include the basalt cliffs of the Columbia Gorge and other areas, talus slopes, and caves and burrows. Cliff and rim habitats are occupied by a variety of birds and potentially by the threatened peregrine falcon. The seven percent of the Forest in talus slopes provides browse and nesting places for pikas, marmots, woodrats, and other animals, and habitats for specialized species such as salamanders. Bats, mice, woodrats, and coyotes use caves and burrows for nesting, hiding, and resting.

c. Relationships to the Natural Environment

The more diverse the habitats, and the greater the number of species in a given area, the more stable will be the wildlife environment of that area. Stability is necessary if an undesirable, abrupt change in animal populations is to be avoided. Environmental stability is also desirable in overall management of the Forest, as it can reduce such problems as insect or other pest damage to trees. Some differences in environmental stability can be illustrated by comparing a forest to a cornfield. A cornfield is so un-

stable it requires constant attention, cultivation for weed control, and spraying for insect control. A forest can remain stable with far less attention. Nevertheless, a forest consisting of a relatively few species of plants and animals is far less stable than one rich with plant and animal diversity.

(1) *Habitat Use and Dependency.* Approximately 265 terrestrial vertebrate species of animals spend at least part of their lives on the Forest. The accompanying table summarizes the use of habitats by stand condition(s) according to age-class and special habitat.

Table III-9

Summary Of Wildlife Use By Stand Condition

NUMBER OF SPECIES	STAND CONDITION(S)
179	Grass/forb
198	Shrub-dominated
163	Pole-sapling
172	Young forest
173	Mature forest
159	Old growth

The function of any habitat depends upon the species using it and the type of habitat involved. One animal may use a given habitat just because it is available. Another may depend on the habitat for survival. The next table sum-

Table III-10

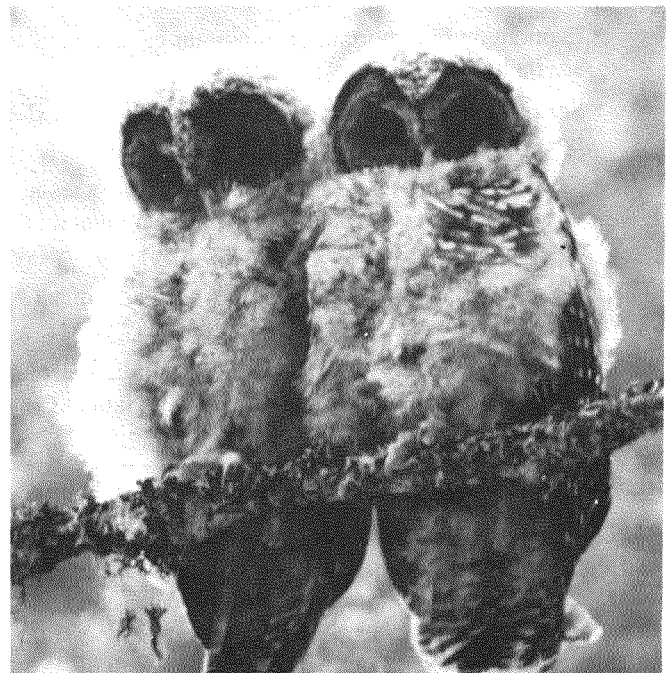
Species Which Use Or Require Special Habitats By Type

SPECIAL HABITAT	USED BY	REQUIRED FOR SURVIVAL BY
Riparian	16 Amphibians 124 Birds 57 Mammals 11 Reptiles	7 Amphibians 13 Birds 6 Mammals
Caves/Burrows	6 Amphibians 8 Birds 54 Mammals 7 Reptiles	1 Bird
Cliffs/Rims	3 Amphibians 30 Birds 29 Mammals 4 Reptiles	5 Birds 2 Mammals
Downed Materials	12 Amphibians 20 Birds 46 Mammals 25 Reptiles	3 Birds
Snags	20 Amphibians 59 Birds 25 Mammals	25 Birds
Talus	5 Amphibians 14 Birds 31 Mammals 5 Reptiles	1 Amphibian 2 Mammals

marizes the number of species which use, or depend upon, the six types of Forest habitats.

(2) *Endangered species.* Species considered in danger of extinction are classified as endangered. Species at risk of becoming endangered are threatened. Species at risk of becoming threatened due to their small numbers or critical habitat requirements are classified as sensitive. The Forest is currently consulting with the U.S.F.W.S. regarding threatened and endangered species according to Sec. 7 of the Endangered Species Act.

Threatened and endangered species habitats are available across the National Forest lands. At this time no known natural reproduction is occurring. However, threatened/endangered species such as the bald eagle or peregrine falcon could move into some of the Forest habitats suitable for them. Potential habitats for bald eagles may be found in the Columbia Gorge or the Bull Run Watershed. Bald eagles have been seen wintering off the Forest near the Columbia River. In recent years, re-introduction of the peregrine falcon to the Columbia Gorge has been attempted, and if these attempts prove successful, the Forest could provide a habitat for this bird of prey. Sensitive species on the Forest include the spotted owl and the Larch Mountain salamander. The spotted owl requires old-growth forest and occupies old-growth stands throughout the Forest. The salamander lives in talus often adjacent old to growth in the Columbia Gorge and the Bull Run area.



Spotted Owls

(3) *Wildlife populations.* Except for a few species, wildlife populations can only be estimated. According to a survey of spotted owls, more than 100 pairs live on the Forest. Populations of big game species, and their harvests, for the period 1981 to 1983 are summarized in the following table.

Table III-11
Population and Harvest of Big Game

SPECIES	FY 1981		FY 1982		FY 1983	
	POP. EST.	HARVEST	POP. EST.	HARVEST	POP. EST.	HARVEST
Black Bear	1,100	67	1,123	70	1,157	72
Black-tailed Deer	16,240	1,990	15,428	1,891	15,890	1,948
Elk, Rocky Mt.	*	*	1,375	140	1,380	104
Elk, Roosevelt	*	*	1,025	45	1,056	46
Mountain Goat	6	0	6	0	7	0
Mountain Lion	**	**	80	0	82	0
Turkey	**	**	875	16	850	36

Source: Personal communication with Oregon Department of Fish and Wildlife. * Data for both species of elk combined in FY 81. Combined population was estimated of 2,400; harvest 190. ** Not included in 1981 data.

(4) *Indicator species.* Certain species of wildlife, called indicator species, can presumably represent the habitat needs of other species because they have similar biological traits. Wildlife designated as indicator species receives special attention. Spotted owls, for example, indicate the needs of a variety of animals which use old-growth forests. Special areas are set aside for them in the various alternatives.

The process of selecting indicator species includes one or more of the following three criteria.

- Economically important or important game animals are included.
- Sensitive or may be a candidate for listing as sensitive, threatened, or endangered.
- Representative of a particular habitat. A species in this category serves as indicator of the amount and condition of the required habitat(s) available.

The following table lists species that are used as indicator species for the Forest, and the habitat types they utilize.

Key to condition symbols: (CD): Habitat Condition Declining. (CI): Habitat Condition Improving. (CS): Habitat Condition Stable.

d. Relationships to the Human Environment

(1) *Economic Impact.* Maintenance of wildlife habitats, especially those of sensitive species, will prevent full uses of resources in some areas with a proportionate reduction of those resources' benefits. However, it may be possible to develop resources without negative impact as long as wildlife needs are taken into account.

Harvesting timber is an example of the ways protecting wildlife habitats can impact the Forest's economic resources. When timber is harvested, the activity immediately

replaces one type of habitat with another. As the timber stand regenerates, still other types of habitats develop and are replaced. A host of interlocking factors determines whether a particular timber harvest will have beneficial or negative effects on any species of wildlife. As noted earlier, small clearcuts may benefit deer and elk, but a series of large clearcuts closely spaced and executed over a short period of time, will devastate deer and elk populations. In fact, large expanses of even-age stands materially reduce the desired diversity of habitat, and are therefore negative influences on almost all species of wildlife.

Table III-12

Proposed Indicator Species for Mt. Hood National Forest

SPECIES	REASON FOR LISTING	HABITAT TYPE
Elk (CI)	Hunted	Grass/Forb, Seedling/sapling
Deer (CI)	Hunted	Same as elk
Pileated Woodpecker	Indicates snag/down material habitat	Mature, old growth, slash snags
Pine Marten (CD)	Requires close-in distributed old growth	Old growth, mature growth
Spotted Owl (CD)	Sensitive species (F.S.)	Old growth
Turkey (CD)	Hunted: Associated with pine/oak habitat	Pine oak (East side)
Silver-gray Squirrel (CS)	Same as turkey	Same as turkey

Some methods used to harvest timber can adversely affect the Forest's six special habitats. Unless snags and down material are specifically maintained, these habitats will decline in number and quality. If riparian areas are not protected, timber harvesting can inflict special damage on them. Roads built to harvest timber adversely affect deer and elk habitats, and the continuous use of harvest roads is particularly harmful. On the other hand, these and other resources may be used when wildlife habitats are preserved. For example, cooperative road closures can reduce the impact of harvest roads on wildlife.

(2) *Psychological Impact and Demands.* The mere presence of wildlife is a source of satisfaction for many people. Some individuals are pleased just to know mountain lions or spotted owls live without harassment on the Forest. The demands of others range from observation and photography to hunting. Present indications are for increased demand for wildlife protection, with the demand for observable wildlife exceeding the demand for hunting.

The attraction of wildlife for visitors to the Forest can sometimes produce unfortunate results. Too many people in a wildlife area can annoy animals, especially when they are rearing their young. This environmental impact must be considered along with some animals' potentials for en-

vironmental damage. If wildlife such as deer, elk, black bears, pocket gophers, and porcupines become too numerous in an area, they can harm trees like seedlings and saplings.

e. Management Concerns

Wildlife-management goals have for all practical purposes been established by Forest Service regulations, particularly Department of Agriculture Regulation (DR 9500-4). This directs that habitats for all existing native and desired non-native species of plants, fish, and wildlife must be managed to maintain, as a minimum, viable populations of such species. For a population in the animal kingdom to be viable, it must have enough individuals to readily reproduce young sufficient to maintain the species. Implicit in this requirement are two additional factors. One is that a given population should have enough individuals to insure genetic diversity; i.e., avoid inbreeding. The second is to maintain and improve, or enhance existing habitat diversity.

(1) *State and Forest Coordination.* The Forest and the Oregon Department of Fish and Wildlife cooperate in management of wildlife on the Forest. The basic arrangement is for ODFW to manage wildlife populations while the Forest manages the habitats. The basic planning document for fish and wildlife on Oregon's National Forests is a five year plan updated annually. The Forest cooperates in formulating and updating this plan.

(2) *Indicator Species Management.* Selected species will be used to evaluate the effectiveness of managing a particular habitat. The Forest Service has listed spotted owls as a sensitive species protected by the policy which directs that populations of sensitive species be maintained. The spotted owl is a species that depends on old-growth forest habitats. It is presumed that if the owls can maintain a viable population in the designated habitats, all other wildlife dependent on, or using, old growth, will survive as well.

An interim management plan for spotted owls will be in effect until the Forest Plan is adopted, or the Regional Forester provides new direction. The present plan provides for the maintenance of 35 Spotted Owl Habitat Areas (SOHAs). Each of the owl pairs distributed throughout the Forest is in a location that includes a 300-acre core area of contiguous old growth. An additional 700 acres of old growth for foraging is available within 1.5 miles of the core center. Timber cutting is not scheduled in the SOHA's. The owl pairs are monitored regularly to make sure the maintained habitats are occupied.

Because little is known about the requirements of the Larch Mountain salamander, the Forest has no management plan for its habitats. It lives on talus slopes often associated with old-growth forests, mainly in the Columbia

Gorge and the Bull Run. This species does not appear to be in any immediate danger.

Parts of the Forest have been designated as wildlife-management areas for winter ranges for deer and elk. They are:

- (a) Part of the Big Bottom meadow on the Clackamas District.
- (b) Wildhorse Area on the Bear Springs District.
- (c) Badger-Jordan Area on the Barlow District.

Although these areas have been designated for wildlife management, they are also being managed for other uses, including timber harvest. Spotted owl areas, and winter-range areas for deer and elk are the only special wildlife areas now recognized as such on the Forest.

(3) *Quality of Habitat Concerns.* Current trends indicate continued improvement in the quantity and quality of habitats for deer and elk. Clearcut timber harvesting and careful planning of areas for forage and cover should produce stable or slightly increasing populations of these animals.

On the other hand, there is concern that the quality of pine-oak habitat, never very plentiful on the Forest, is declining. Timber harvests reduce the number of large old pines needed as roost trees for turkeys and shelter-nesting trees for silver gray squirrels. Further decline could be arrested as indicated by a timber sale in the pine-oak habitat conducted in consideration for wildlife. The clearcuts were small, and several large old pines per acre were maintained for use by squirrels and turkeys. This result suggests that comparable management could maintain the habitat.

Another concern is the decline of habitat capability for species depending upon old growth. Timber harvests are reducing the quantity, quality, and distribution of this essential habitat. The decline in many areas is accelerated by road construction, wildlife harassment, disease, and insect pests.

Concern for declines in habitats of snags and downed materials led to changes in management techniques which have slowed the trend. In recent years, snags in old-growth forests have been left standing in many timber sales, specifically to benefit wildlife. Downed woody material has also been protected for wildlife uses.

In spite of substantial and increasing concerns over the conditions of riparian habitats, these have been and will continue to be lost. As riparian habitats decline, species which use them, or totally depend upon them, will also decline in numbers. Although there have been attempts to preserve these habitats, current indications are for continued decline in habitat diversity as old-growth habitats and riparian habitats are reduced. Other special habitats associated with riparian resources will also be reduced.

12. Fire

a. Background

On the Forest, fires vary in intensity and effect, depending on climatic conditions, the amount of fuel available, and topography. Most of the Forest's precipitation falls in winter, leaving the summers comparatively dry. This climate, combined with other environmental factors, produces dense conifer forests with large accumulations of woody debris. This material may accumulate as snags, large logs, or as deep beds of needles blanketing the forest's floor. When dry, these materials make excellent fuels. Forest fires start when the buildup of fuels combines with dry summers and lightning or other ignition.

Fire can affect the forest environment beneficially or negatively. The effect of prescribed fire versus wildfire on a partial-cut stand of east-side ponderosa pine illustrates the point. (A partial-cut stand is one in which only a portion of the standing timber is removed.)

Prescribed fires follow a known prescription: deliberately set, carefully controlled. A prescribed fire will remove logging slash and create small areas of mineral soil where tree seedlings can start to grow. If carefully executed, the burn may rejuvenate bitterbrush and improve the value of these plants for wildlife browse. In this example, the prescribed burn reduces the fire hazard, prepares a seed bed, and increases the food supply for deer and elk.

The same partial-cut stand would be affected very differently by a wildfire. Such fire would kill most or all of the trees and leave a stand of snags. The fire might also remove all of the duff and humus layers on the forest floor, leaving the soil vulnerable to wind and water erosion. Bitterbrush and other forage plants would be completely removed, to be replaced, under some conditions, by less palatable plants.

In one instance, fire would be a carefully controlled tool. In the other it would be an agent of destruction. This dichotomy of effects is a basic factor in the Forest's fire management policies.

As suggested by the example, the goals of fire management on the Forest are to reduce the damage of wildfires and use prescribed fire as a beneficial tool. Maximum control of wildfires calls for the prevention and suppression of all unplanned fires. The primary purpose of prescribed fire is to reduce accumulations of fuel, but it is also used for site preparation and the improvement of wildlife habitats. A look at the present situation reveals the scope and complexity of these tasks.

b. Fire History

During the seventies, a total of 1,278 fires burned on the Forest. The number of acres consumed was 13,597, representing 1.2% of the Forest's total area. People started the

greatest number of fires and human-caused fires burned the most acres. Although recreational visitors caused most of the fires, the blazes which burned the most acres and caused the most damage began as the result of logging operations or escaped slash burns.

Table III-13

Wildfire Causes and Acres Burned 1970-1979

CAUSES	PERCENT	AVERAGE ANNUAL NUMBER OF FIRES	TOTAL ACRES BURNED
<u>All Causes</u>			
Lightning	18	27.5	109
Human actions	82	100.3	13,488
Total	100	127.8	13,597
<u>Human Caused Fires</u>			
Timber harvest	8	8.2	11,435
Recreational	92	92.1	2,053
Total	100	100.3	13,488

Although the greatest number of fires began in stands of mature timber, these fires did not cause the most damage. The worst fires, measured by damage caused and difficulty of control, started in logging slash. As an example, during the decade just summarized only 3 percent of all fires larger than 1/4 acre started in slash. But that 3 percent accounted for 85 percent of the total acres burned.

During the latter part of the seventies, the number of fires started and the number of acres burned decreased. The reductions were obtained through a program designed to prevent fires caused by industrial operations. In addition, increased care in burning slash was emphasized, and the extra precautions helped to reduce the number of slash fires escaping.

c. Relationship to the Natural Environment

(1) Vegetation.

All types of vegetation on the Forest developed subsequent to fires of natural origin. The frequency and intensity of fire has, to considerable extent, determined the species of trees present. Because of this biological fact, the Forest's policy of fire suppression has had unexpected side effects. One effect is a decades-long buildup of fuels in some areas of the Forest. Some types of vegetation may also be in the process of change.

Surface fires were a common occurrence in ponderosa pine before the advent of forest management. These fires reduced fuel loadings and killed tree species sensitive to fire. The thick-barked pines thrived under a regime of frequent, low-intensity fires which killed off competing vegetation and provided a seed bed for light-demanding pine seedlings. As a result of fire suppression, shade-tolerant species of trees now grow under the pines and may eventually replace the pines on the east side in the

Ponderosa Pine Zone. Continued harvesting of old-growth pines in the zone accelerates this trend.

Catastrophic fires with long intervals between them produced the large stands of old-growth Douglas fir growing on the west side in the western hemlock zone. Intense fires periodically swept these forests, burning through the deep accumulations of duff and exposing mineral soil. The thick bark and thrifty growth habit of the Douglas fir allowed it to survive intense fires at a higher frequency than other west-side species. This allowed the fir to seed in after fires and to dominate post-fire succession. In some respects, the policy of clearcutting with slash burning has imitated this process and allows the valuable Douglas fir to dominate managed stands.

Fires in the mixed conifer and true fir zones also tend to be intense, stand-replacing burns. Post-fire succession is less well understood in these stands, and a mixture of species is often the result of fires in either of these zones. It is important to note that any combination of fire intensity can occur in any stand, depending on the key variables of climatic conditions, fuels, and topography.

The interaction between forests and fire in the Pacific Northwest is quite complex. Less intense, light fires which remain on the ground do not necessarily kill trees. In fact, such fires may remove fuel and thereby prevent a catastrophic fire. Intense fires, especially those which burn the heavy fuels on the west side of the Cascades, are often quite destructive and may kill all trees in a stand.

(2) *Wildlife*. The interaction of fire and wildlife is another complex issue. Fire has short and long range effects which can impact wildlife in a variety of ways. Some animals depend on old growth while others need meadowlands or brush. Whether or not a given fire affects a particular species of wildlife depends on the fire's intensity, size, location, and what it eventually does to the vegetative environment. A particular fire may be damaging in the short run by destroying food and cover for wildlife. In the long run, however, fire may help to maintain the habitat for a particular species. Except for catastrophic fires which can destroy many animals, most larger species of animals can move away from a fire. Some animals, like birds of prey, find food easier to obtain immediately following a fire because of the dead and injured small mammals left behind.

(3) *Wilderness*. The current fire-suppression strategy in Wilderness is to suppress fires as quickly as possible. Because fire has played a part in the natural ecosystems of the Pacific Northwest, the policy of immediate suppression of fires may, in some cases, have changed the natural characteristics of the Wilderness. Buildup of fuel or changes in species composition are problems which may need to be handled in some Wilderness areas.

Due to these changes in fuel loadings and species composition, the possibility of allowing ignitions from lightning to

burn as prescribed fires is under consideration. Such a change would allow fire to play a more natural role in Wilderness ecosystems. The change would permit fire to burn within prescribed limits unless adjacent lands or human lives were endangered.

(4) *Other Resources*. In general, fire profoundly affects other resources according to its location, size, and intensity. Large and intense fires are more likely to degrade resource values than light fires. Fires may affect water quality, especially if the fire is severe enough to burn away most of the vegetation. The loss of ground cover can increase erosion, sedimentation, and elevate water temperatures. Water runoff may also increase in such aftereffects. However, some resources are enhanced by wildfire occurrences. For instance, the yields of huckleberries often increase after a fire.

Specific fire effects on each particular resource are discussed under this chapter's heading for that resource.

d. Relationship to the Human Environment

By far most of the damaging fires on the Forest are caused by people, and most of these fires are the result of industrial operations. Reduction in serious fires is possible through care in slash disposal and other preventive measures.

Communities around the Forest are affected by both wildfires and planned burns. Wildfire can damage resources and amenities which the people in these communities use. If the disposal of slash by burning is prevented, the potential for wildfires increases, and this jeopardizes the future production of timber. This development would have obvious impact on community employment, especially in timber-dependent communities. Conversely, if slash burning is allowed, resulting smoke may impact air quality and the Forest's scenic values.

In order to preserve the natural character of some Wilderness areas, a policy to allow some natural but closely observed burning may be adopted.

The loss of areas with high recreational values by a catastrophic fire is always possible. On the other hand, recreational visitors to the Forest can and do start fires in their use of campfires, cigarettes, or fireworks. However, as a prior discussion pointed out, fires started by recreational users do not cause the most damage.

Management for visual resources and wildlife may require the use of smaller clearcuts. Slash treatment of smaller clearcuts is far more expensive and requires more labor per acre than other treatments. Conversely, the treatment of logging slash is a must if visual quality is to be maintained. Burning is often the most cost-effective and most natural-appearing method of slash disposal.

Wildfires may totally destroy structures including administrative and historical sites and summer homes. Very little private land is intermingled with Forest land so that only a few small communities would be threatened by wildfires.

e. Management Concerns

Fire management on the Forest follows the maxim that "fire is a good servant but a poor master." Prescribed fire is regularly employed for disposal of unwanted vegetation in ecologically sound and cost-effective techniques. At the same time, concern over the destructiveness of wildfires has led to an aggressive policy of prevention and control.

A special management concern is to coordinate the Forest's fire-management program with State, local, and other Federal agencies. The Forest Service has a cooperative agreement with the State of Oregon for fighting fires on adjacent lands. All agencies which deal with wildfires use educational programs to inform the public about fire prevention.

(1) Timber Harvest. When old-growth stands are logged, large quantities of highly flammable residues (slash) are produced. Slash disposal is a major forest-management activity funded mainly by cooperative deposits from timber sales receipts. Although slash may not always be burned, present silvicultural knowledge indicates that, on most sites, slash must be reduced to a given level before new trees will grow. Burning is often the best method for reducing the level of slash.

Slash may be piled for burning later when weather conditions are favorable. Often slash is broadcast burned, that is, where it lies on the ground. Broadcast burning is preferred on sites where the use of machinery may compact the soil, or where steep slopes prevent the use of tracked vehicles. In some types of vegetation, broadcast burning closely approximates the natural fires which swept these forests before the advent of logging. On a yearly basis, the Forest produces approximately 4,300 acres of clearcut logging slash and 1,500 acres of shelterwood cut slash. Other timber-harvest activities, such as salvage logging, result in an additional 2,700 acres of ground that require slash treatment.

(2) Fire Suppression. The organization set up to fight fires on the Forest is designed to detect, attack, and quickly suppress all fires in the most cost-efficient manner. A system of aerial flights and lookout staffing during periods of high fire danger is responsible for prompt detection. A variety of aerial and ground forces including air tankers, pumpers, and hand crews provide the initial attack. Hand crews, bulldozers, and different types of water-handling equipment are used to finish the job. During an average fire season (from June 10 through October 15), about 10% of

the days are estimated to be extremely high risk days for fire. Risk is determined by fuel and weather conditions.

(3) Wildfire Control Factors. The occurrence of wildfires depends upon a variety of factors including many beyond the Forest Service's control. Factors which the Forest can control are managed on the basis of prevention rather than fighting fires after they have started. Slash is one of the most important factors subject to management direction as it is primarily the result of timber harvesting. If slash is used for wood chips or burned by homeowners for heating, less of it would require disposal. The market for wood chips controls one method of slash disposal, and the ability of woodcutters to reach slash locations determines the amount of slash used by homeowners. Aside from the change in fire suppression being considered for Wilderness Areas, the need for fire suppression on the Forest will ultimately be determined by the frequency and intensity of wildfires.

C. Human Environment

1. Communities.

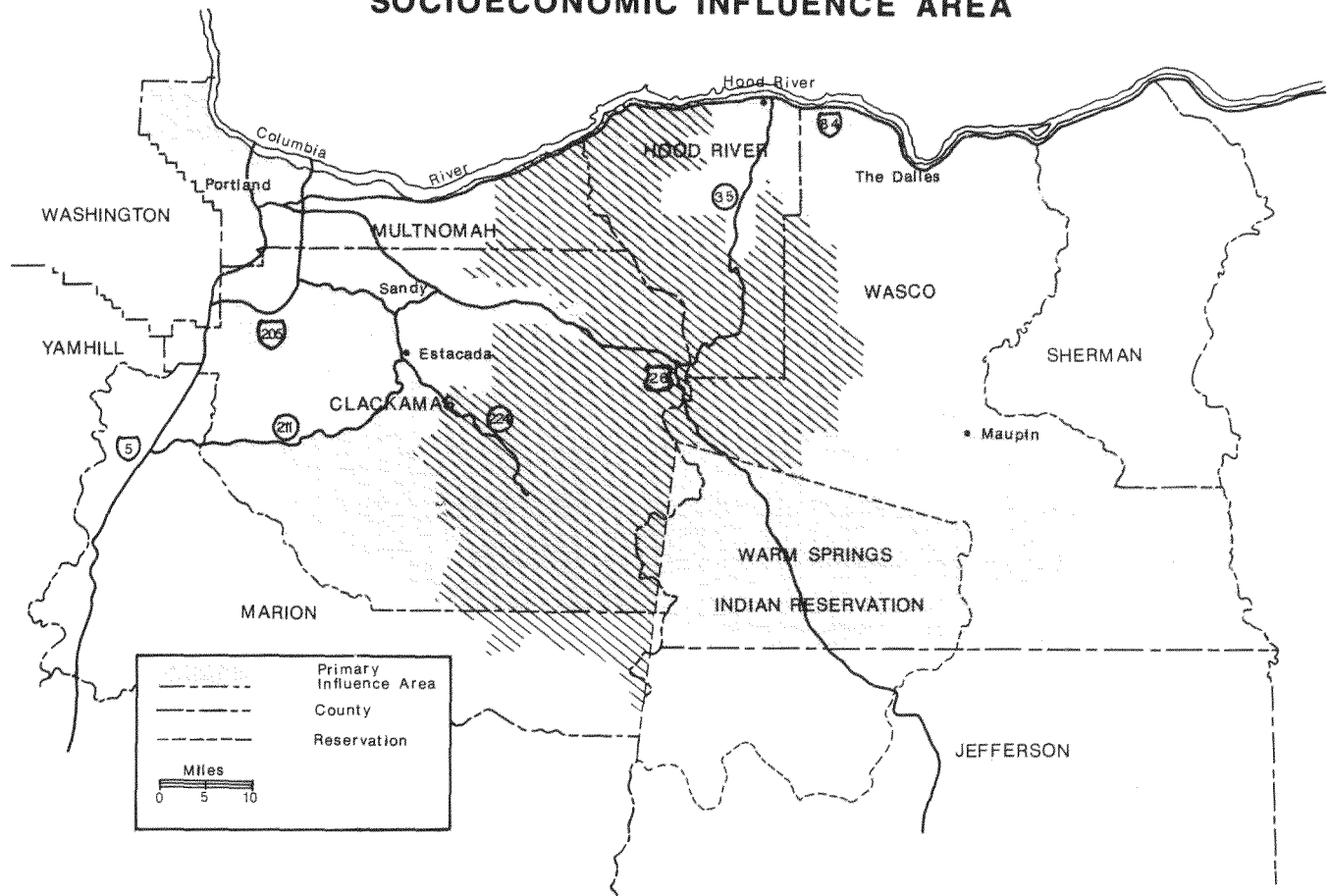
a. Background

The Forest is not only an integral part of the region's natural environment, it is also a major component of its social and economic world. People who live in the region use the Forest for work and for play. The interests of these citizens have a special impact on the management of the Forest.

The relationships between the Forest and the communities near it are subjects of great concern to all involved in the Forest's management. These concerns cover not only how to provide the most effective management of the Forest's resources, but also how those resources impact human beings who visit the Forest or need its products for their livelihood. The economic health of communities adjacent to the Forest is a concern that must be balanced with priorities for resource protection, maximizing public net benefits (PNB), and other requirements stemming from laws governing management of the National Forests.

(1) The Influence Area. Clackamas, Hood River, Multnomah, and Wasco Counties are the four counties closest to the Forest. They interact most directly with it and form what is called the Influence Area (see accompanying map). Wood-flows to mills link Marion County communities to the Forest, but that association is minor compared to the impact of the four counties to the north. The Influence Area includes Portland, the largest city in Oregon and a center of trade and manufacturing. The proximity of Portland's large and diverse population makes that metropolitan area the dominant factor of the social and

SOCIOECONOMIC INFLUENCE AREA



economic setting in which the Forest operates. However, a number of small towns and sparsely settled rural areas, especially on the east side of the Forest, are part of the Influence Area.

As might be expected, the closer people live to the Forest, the stronger are their ties to it, so that many residents of the four-country area become closely involved with the Forest's resources and activities. Some urban residents look on the Forest as a kind of "backyard" for Portland. Many rural residents feel a sense of ownership of the Forest, and some of them depend upon it. The proximity of a highly diversified population in a large urbanized area creates concerns about the Forest which are complex and at times mutually exclusive.

(2) *Population.* The number of people living in the Influence Area has grown significantly within the last 50 years. The largest increases in population came on the west side of the Forest, adjacent to Portland, and in the Mt. Hood Corridor. In ten years between 1970 and 1980, the Portland Metropolitan Area population increased by 22.5 percent and exceeded 1.1 million. Recent U.S. Census estimates put the population of Clackamas and Multnomah

Counties in excess of 800,000, of which 688,000 people live in the urban sections of these two counties.

Hood River and Wasco Counties, on the east side of the Influence Area, lost population between 1960 and 1970, but after 1970, the trend reversed. These counties gained population significantly with growth concentrating in The Dalles and Hood River. The total population of the two counties on the east side in 1960 was 37,600 (U.S. Census Bureau). Only one part of the Influence Area, Multnomah County, did not grow significantly in the 1970's even though Multnomah's east-side communities, like Gresham, grew rapidly. This county has 1,300 people per square mile, and the high-population density, combined with its urban lifestyle, apparently encouraged people to emigrate from the urban core to suburban and rural locations.

The population of the Influence Area is overwhelmingly white and of northern European extraction. Minority populations live principally in Multnomah County, and to lesser extents in southern Wasco County and the upper Hood River Valley. Minority use of the Forest appears to have been limited by lack of information about opportunities in both recreation and employment. Exceptions to the overall minority situation are the Warm Springs Tribes'

use of the Forest, mushroom gathering by Asian Americans, and other activities specific to ethnic groups.

Population in the Influence Area is expected to reach 1.2 million people by the year 2,000, representing an average yearly increase of 3.2 percent. The largest increases are anticipated to occur in the Portland Metropolitan Area. Suburban and rural parts of Clackamas County should absorb most of the additional population. Gains are projected for Hood River and Wasco Counties, but not as much as for counties on the west side.

b. Socioeconomic Overview

Highway, rail, and river system come to a crossroads at Portland, and this city provides distribution and commercial centers for the Influence Area and the region. A large base of manufacturing firms, including several high-technology industries, strengthen the economies of the west-side urban area. Highly productive forest and agricultural lands, wood products, grain, and fruits add diversity to the economic base. Not least of all, the magnificent scenery and recreational opportunities of the Influence Area offer powerful attractions for tourists and, in some cases, industry.

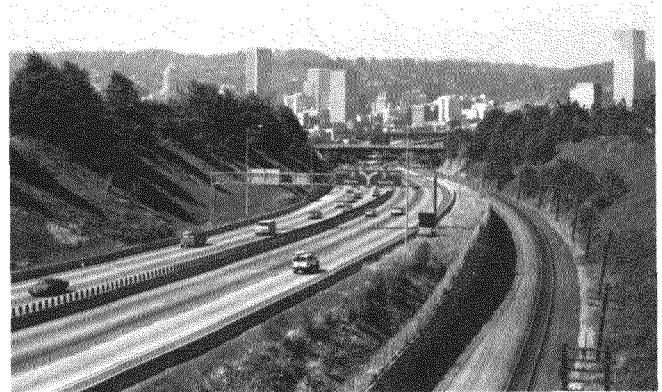
In spite of the Influence Area's strong economic base, economic growth has not been evenly distributed. The economies of west-side urban and suburban areas such as western Clackamas County, and to a lesser extent the larger east-side communities, have grown the most. Rural communities and unincorporated areas continue to be relatively dependent on forest products and agricultural employment. Since economic conditions vary so widely within the Influence Area, the economic and social conditions of each type of community will be taken up separately beginning with the largest community in the region.

(1) The Portland Metropolitan Area. This area is a major northwest center for manufacturing, trade, and finance. The largest manufacturing firms make instruments and machinery, fabricate metals, and process food. Portland's status as a trade center derives from its location. It sits as a hub of ground and water transportation feeding into two major highways, a deep-water port, and the Columbia River.

In 1981, more than 100,000 people worked in retail and wholesale trades. Wood-products manufacturers in Multnomah County employed about 4,500 people. Employment opportunities have shown recent growth in finance, insurance, and realty firms in the area; currently two dozen banks offer financial services through 250 offices.

The most recent census data places the population of Portland city proper at 368,000. The city grew rapidly through the 1970's primarily due to immigration of people attracted by the area's job opportunities and quality of life.

Metropolitan communities have expanded with the population, and several outlying communities have large bedroom populations of commuters who work in the central city. Income levels in the metropolitan area are higher than the state average.



Portland is a transportation center.

Proximity to the Portland metropolitan area makes the Mt. Hood National Forest unique and has earned the Forest the distinction of being an "Urban Forest." Unique man-made and natural features and the Forest's many and varied recreation opportunities provide considerable attraction to the residents of Portland and surrounding area. The Forest plays an important role in the leisure activities of many Portland residents, and has given them a special sense of ownership of Forest areas.

The presence of Portland creates a strong demand for recreation of all kinds. Since the ORRRC report,^{1/} the basic working theory of outdoor recreation demand has been related to participation. This theory suggests that outdoor recreation participation (kinds and quality) is a function of socioeconomic factors and the population available for participation in the outdoor recreation activities. This available population numbers more than one million in the Portland metropolitan area. The Forest's boundary is less than a one-hour drive via several major highways from the city of Portland and its large population. Because the Forest is close and readily accessible to this large population, it is popular for one day visits from Portland and attracts many visitors which are more used to urban conditions. Use by this type of visitor creates special problems in law enforcement and management that are not faced by more remote forests. In addition, the urban visitor from Portland is highly concerned with the visual appearance of the Forest.

^{1/} ORRRC report; Outdoor Recreation Resources Review Commission Report.

Some of the features that distinguish this Forest as a resource to be valued by the public are highlighted below. Additional discussion of Forest attractions will be found in the various portions of the second half of this Chapter dealing with Human Concerns, especially 6. Recreation

The Columbia Gorge: The west end of the Columbia Gorge is located east of Portland and can be reached by most Portland area dwellers via a modern freeway within an hour. The Columbia Gorge is probably one of the most spectacular scenic features in the states of Oregon and Washington. The Gorge provides the urban visitor with myriad opportunities for hiking, picnicking, fishing, boating, swimming, water skiing, windsurfing, camping, nature study, and sightseeing. The interesting history of the gorge, starting with the Indian occupation of the area and the Lewis and Clark journey down the Columbia, has provided many opportunities for historic interpretation. Multnomah Falls, the highest waterfall in Oregon, attracts over 2 1/2 million sightseers each year. On November 17, 1986 President Reagan signed Public Law 99-663 which established the Columbia Gorge National Scenic Area (with HR 5705).

Bull Run Watershed: The Bull Run Watershed is the main source of water for the Portland metropolitan area and recently became a source of hydroelectricity for the city of Portland. The Bull Run Watershed furnishes clear unfiltered water for approximately 650,000 Oregonians. Roughly one out of four of Oregon's people drink Bull Run water. The city of Portland is committed to providing unfiltered water to metropolitan residents.

Mt. Hood: Mt. Hood is the highest peak in Oregon and dominates the skyline from anywhere in the Portland metropolitan area. The mountain has come to symbolize the quality of life and the spiritual values of the Portland urban dweller. The mountain is so picturesque it is used extensively to advertise the state of Oregon. Mt. Hood is the second most often climbed mountain in the world.

These amenities are part of Portland's living attractions and are not taken for granted. Conservation groups in the Portland area have been actively involved in Forest issues and concerns for many years. Primary concerns include the Bull Run Watershed, unroaded areas, wild and scenic rivers, old-growth habitats, threatened and endangered species, and ski area development.

Groups favoring increased resource development are also very active. Their chief concerns are timber supply, management practices, and availability of sales to small mills. Both industry and conservation groups generally work at Forest and Regional levels, but they also exert national influence through lobbies and contacts with congressional representatives.

(2) *Westside Communities.* Clackamas County has a strong and diversified economy, especially in the northwest

urban area. Smaller communities in eastern and southern parts of the county are still tied to resource-based employment. As of 1984, 25 percent of the County's employment was in manufacturing, including some 3,800 people manufacturing wood products. Roughly half of the County's labor force commutes to work in Portland. Major industrial areas include Wilsonville and Milwaukie; smaller manufacturing centers are located in Molalla, Boring, and Estacada.

Forest Service Ranger Stations (Zigzag, Estacada, and Clackamas) are highly visible in their respective communities. They are an important source of local employment and are recognized for other social and economic contributions.

The growth of metropolitan Portland has had a major impact on west-side communities. Located on the fringe of the metropolitan area, their populations have increased dramatically in recent years. Many of these areas' new residents want to combine rural lifestyles with urban amenities. A large number of people who live in Sandy and Estacada commute to their jobs in metropolitan Portland. Thus these areas are diversifying economically instead of continuing to rely on logging and wood processing.

Rural communities on the west side tend to use areas on the Forest closest to them. Some families extend their incomes by fishing, hunting, and woodcutting on the Forest. Concern over timber-harvest levels is considerable on the west side. Many residents oppose non-timber designations of the Forest's land including Wilderness designations. However, this opposition is by no means universal in these communities.

(3) *The Mt. Hood Corridor.* A collection of small communities, including Cherryville, Alder Creek, Brightwood, Zigzag, Wemme, Welches, Rhododendron, and Government Camp along Highway 26 in northeast Clackamas County, makes up this corridor. It numbers 6,500 residents, of which more than half are seasonal.

The corridor was originally logging country, but employment shifted to service and recreation as private land was cut over. Most commercial activity at this time is along Highway 26 in a strip-development pattern. Ninety percent of the 100 commercial enterprises in the corridor employ less than six people. In contrast, three ski areas attracted more than 300,000 skier visits in 1984-85, and produced a substantial volume of commercial activity.

Corridor residents manifest considerable concern about the Forest's management activities. Many of them feel that clear cutting in the corridor will hurt their businesses, property values, scenic values, or damage water quality. The Forest Service sends timber sale plans to 20 organizations in the area to keep them informed. Problems associated with the interface of public and private lands must

be expected to continue, if not increase, as the population in the corridor expands.

(4) *The Columbia Gorge: Cascade Locks, Bonneville, Bridal Veil.* In spite of its proximity to the Metropolitan Area, and its status as a major transportation corridor, the Gorge remains essentially rural. Employment is mainly connected with wood products, maintenance of dams, and some highway service jobs. Some residents commute to work out of the area. With the designation of the Gorge as a National Scenic Area, its residents have become very sensitive to the issue of Federal versus local control.

(5) *Hood River County.* The economy of this County has an agricultural base. More than 15,000 acres are in orchards yielding an annual harvest worth \$37.9 million. A large number of jobs is in processing foods such as fruits and nuts, but this industries' employment is in general unskilled and seasonal. The peak season is July when employment reaches approximately 4590 people. Some economic diversification is achieved through employment in wood products and recreation. These factors are discussed in the review of forest-related concerns to come later in this discussion.

Significant population growth has taken place in the upper Hood River Valley. New and old residents alike demonstrate pride in the scenic and rural character of the Valley. However, growth and development have generated controversy, especially with regard to second home and recreation development. While some people look upon expanding recreational and commercial business as sources of desirable economic diversity, many others believe such development threatens the quality of life in the area.

Trends indicate that east-side rural communities will continue to rely heavily on agriculture and wood products. Reliance on these industries creates high seasonal unemployment in Oregon. The agriculture sector attracts a seasonal influx of migrant workers ranging from 110 in May to 1,145 in July. Most seasonal workers are Hispanic.

In 1984, Hood River County had 674 people employed in wood-products industries. Since 68 percent of the raw materials in these industries came from the Forest, about 460 jobs were directly derived from the Forest's timber.

Employment in recreation is primarily seasonal in this County. Two ski areas employ 350 people during peak season to serve the needs of an estimated 370,000 skiers per year. Other employment in recreation includes service jobs related to sightseeing, hunting, fishing, and, of late, windsurfing.

The Hood River Ranger District generates considerable local employment. Over half of the County's total road budget comes from Forest Service payments in lieu of taxes. Residents and businesses, including agriculture,

depend on Forest-supplied water for domestic uses and irrigation. County residents also use the Forest for recreation and woodcutting.

(6) *Wasco County.* The economic base of Wasco County is agriculture, trade, wood products, and manufacturing. The Dalles dominates the County's population and economic activities. It is a center of trade in the Mid-Columbia region with as many as 300 employees working in food processing industries during peak seasons. Until the recent shutdown of an aluminum plant, work in primary metals provided a significant number of jobs. Wood-products industries including sawmills in Maupin and Tygh valleys employed about 340 people in 1984. The Columbia River provides hydroelectric power and access to shipping.

Agricultural products are major County output. The main crops are grain and cherries, but livestock sales are also substantial. Gross farm sales in the County were \$39.6 million in 1982. The economy of this County is essentially resources-based, with The Dalles area providing some diversification.

Changes have been relatively slow in Wasco County. Rural communities are growing to some extent, but they remain dependent on timber and agriculture as their employment base. Maupin is a local center of manufacturing, tourism, and trade. Tourist-oriented businesses are helped by the proximity of the Deschutes River. Tygh Valley, Wamic, and Pine Grove depend heavily on employment generated by forest products: roughly 90 percent of Pine Grove's work force is so employed. The Friend area and Dufur are basically agricultural communities. Grazing of adjacent forest lands adds to the local economy. People in rural Wasco County generally oppose rapid growth and feel strongly about independence and local control.

County residents have expressed high interest in forest decisions which affect timber supplies, range resources, water, and employment. About 56 percent of Wasco County's raw materials for wood processors comes from the Forest and contributes an estimated 190 jobs. Rural residents look to the Forest for their community water-sheds, log supplies, grazing, wood for heating, and recreation. Forest Service payments to the County reached \$1.6 million in 1984; the Forest Service is also a significant source of jobs in the Dufur and Pine Grove areas. The Dalles Watershed on the Forest is the primary source of drinking water for The Dalles, and for irrigation in rural Wasco County.

(7) *Warm Springs Indian Reservation.* With 640,000 acres located on the southeastern side of the Forest, this Reservation operates as an economic, social, cultural, and political unit. The Confederated Tribes, led by a Tribal Council, direct the use of commonly-owned lands and businesses such as mills and resorts. Members of the Tribes receive

dividends from operating profits and can be allotted land. The Confederation provides education and health and social services.

Population on the Reservation has grown significantly, primarily due to expanded tribal employment opportunities. The periods of greatest growth were between 1950 and 1960, and during the last decade. Most of the population is located in or near the community of Warm Springs on Highway 26.

The Reservation's economy is diversifying as illustrated by increased interest in ranching allotments of land in rural areas. At the present time, about 60% of the Reservation consists of forested land, and its economic base still rests upon wood products, fishing and agriculture. Annual revenues are \$13 million from timber, \$5.6 million from fishing and \$.6 million from agriculture, according to Meyers Resources report to BIA, Meyers Resources, Inc. (Davis CA 4/83). Anadromous fishing is extremely important to tribal members not only for income but for cultural reasons. Tribal members look upon anadromous fish as a gift from God which should not be wasted. In addition to fishing and hunting, they enjoy traditional activities such as root digging and huckleberry picking.

The Tribal Confederation can operate on its own resources, so that direct reliance on the Forest is minimal. However, the Forest has common concerns with the Confederation about anadromous fishery, wildlife management, transportation, and fire.

c. Economic Concerns

Economic activity in the Influence Area falls into two different categories which in turn define two different economies. Manufacturing, trade, and finance in the Portland metropolitan area are by far the dominant economic factors in the Influence Area. This diversified urbanized economy operates on strengths largely independent of the Forest's resources which minimizes its influence, the important exception being the Forest as a tourist attraction. Table III-14 indicates the broad relationships between the metropolitan economy (nonForest-oriented), and the much smaller rural economy heavily influenced by Forest resources and activities.

Table III-14

Influence Area Work Force and Income^{1/}

COUNTY	WORKFORCE	% TOTAL WORKFORCE	PAYROLL (MM\$/Year)	% TOTAL PAYROLL
Multnomah	206,326	78.3	6,015.20	81.8
Clackamas	44,963	17	1,133.90	15.4
Wasco	6,846	2.6	109.62	1.5
Hood River	5,356	2.1	88.67	1.2
TOTAL	263,491	100	7,347.40	100

^{1/}All figures are for 1984

One of the most important economic factors of Forest Service management to counties in the Influence Area is the Payments to counties made from Forest Service Receipts in Lieu of Taxes. The Forest Service receives receipts from timber harvest receipts and a variety of activities such as grazing, recreation and other permits, mineral leasing, and sale of rock. Counties receive 25 percent of these receipts. The amount of the payments received by individual counties is based on the percent of the national Forest that lies within the county. These payments to the counties are prescribed by law (Twenty-five Percent Fund Act of 1976, Ch. 192, 35 Stat. 251, 16 USC 500) to be used for building and maintaining schools and roads within the counties. These funds are important to rural communities within the Forest's Influence Area.

Table III-15

Average Payments to Counties from Mt. Hood National Forest Receipts for Fiscal Years 80 To 84

COUNTY	PERCENT DISTRIBUTION*	ANNUAL PAYMENTS TO COUNTIES
Clackamas	47.3	\$ 4,504,428
Hood River	19.8	1,885,574
Wasco	19.4	1,847,482
Multnomah	6.7	638,048
Marion	6.4	609,479
Jefferson	0.4	380,924
Total	100	\$ 9,865,935

*Percent distribution based on amount of National Forest within the County. Based on 25% of the receipts to the Government from National Forest management activities.

Table III-16 indicates typically how the mix of management activities contributes to the total receipts that payments to counties are based on.

Table III-16

Payments to Counties from Mt. Hood National Forest Receipts by Management Activity for Fiscal Year 82

MANAGEMENT ACTIVITY	FY 82 RETURNS TO THE GOVT.	FY 82 RETURNS TO THE COUNTIES
Timber Sale Receipts	\$ 18,612,748	\$ 4,653,187
Recreation Permits and Fees	267,120	66,780
Grazing Fees	14,731	3,682
Other Receipts	163,374	43,343
Total of Payments FY 82		\$ 4,766,993

Pursuant to a law passed in 1976, counties receive payments in lieu of taxes. These payments are based on ownership of Federal land and on production of outputs or receipt sharing.

The focus of the remaining discussion will be on the sectors of the economy within the Influence Area that are in-

fluenced by the Forest's management activities. The most significant sectors are recreation and wood products. The components of the recreation industry are less easy to identify than are wood processing facilities, and the discussion is consequently much more general. Livestock and mineral resource production from the Forest presently plays a very minor role in the area's economy. Further discussion of the management programs on the Forest for each of these resources may be found in later sections of this chapter.

(1) *Recreation.* Tourism has played a leading role in producing an 18 percent statewide increase in service and miscellaneous jobs between 1977 and 1981. The Forest is a major tourist attraction resulting in visits averaging more than 4 million persons per year. The two most popular tourist destinations in Oregon are Multnomah Falls and Timberline Lodge, both on the Forest. Out-of-state visitors spend both time and money in the Influence Area. On average, Oregon visitors spend 16% of their time in the Portland/Columbia Gorge area, and another 16% of their time in central areas such as Wasco and Hood River Counties. The average expenditure per trip, per party is \$427.

These expenditures are swelled by additional expenditures of Influence Area residents who visit the Forest. These visitors help to support nearby businesses by purchasing gasoline, food, and other commodities. Taxes paid on various taxable items provide state and county income. As tourism has grown in the Influence Area, the economic bases of some corridor communities continues to be defined in terms of timber supply, but as the corridor increasingly relies on recreation and tourism, stability in some communities may be a question of continuing to attract the business of visitors.

(2) *Timber Harvest.* As noted earlier, the manufacturing, trade, and finance services have substantially expanded the employment base of the urbanized sectors in the Influence Area. These changes have diminished the importance of agriculture and forest products to the area taken as a whole. However, smaller towns in the four-county area, especially the rural communities, continue their historical reliance on wood-products industries and agriculture as major components of their economies. In past decades, economic growth was rapid and cyclical, with peaks and valleys in production and employment. Recent trends indicate that, while woods products continue as a major source of area income and jobs, the long period of growth in wood industries employment is over. According to the State of Oregon Employment Division, Dept. of Human Resources, wood-products employment dropped from 11,171 in 1978 to 8,898 in 1984. This is less than 4 percent of total work force employment in the Influence Area. (See Table III-16) The accompanying table showing four-county, timber-related employment summarizes the situation as it existed in 1984.

The Cascade Mountain Range separates Hood River and Wasco Counties from the Portland metropolitan area. This physical barrier contributes to a markedly greater dependence of the east side market areas on the Forest's timber. The markets on the east side are less diversified than the communities within commuting distance of Portland. People living in communities within the east side market areas have less opportunities to change from jobs in the forest products industries to jobs in other industries. Effects of changes in timber supply are likely to be more severe in east side market areas than in west side market areas, where people have more opportunities to substitute another job for a job lost due to shifts in timber supply.

Table III-17

Estimated Employment Derived From National Forest Timber ^{1/}

INFLUENCE AREA	BF VOLUME REMOVED			COVERED EMPLOYMENT *	
	County Total	National Forest	% National Forest	Wood Products Employment ^{2/}	Employment Contributed by NF Volume
Clackamas	359,448,000	244,781,000	70	3,846	2,692
Hood River	51,542,000	35,368,000	70	647	472
Multnomah	13,193,000	4,849,000	35	4,464	1,562
Wasco	161,268,000	91,062,000	50	339	169
Influence Area Total	585,451,000	376,060,000		9,323	4,950

Does not include government employees, or self-employed workers.

The changes in the wood-products industries in the Influence Area are difficult to understand without looking at the effects of timber supply and demand. The Forest, various private landowners, and the Warm Springs Indian Reservation supply the bulk of wood to mills in the Influence Area. Supply problems and raw materials costs have increased as logging has moved to steeper, more remote areas, and measures have been instituted to protect the environment. Additional information pertaining to the Forest's contribution, and resolution of timber-supply questions may be found in the subsection on cumulative effects in the Community section of Chapter IV.

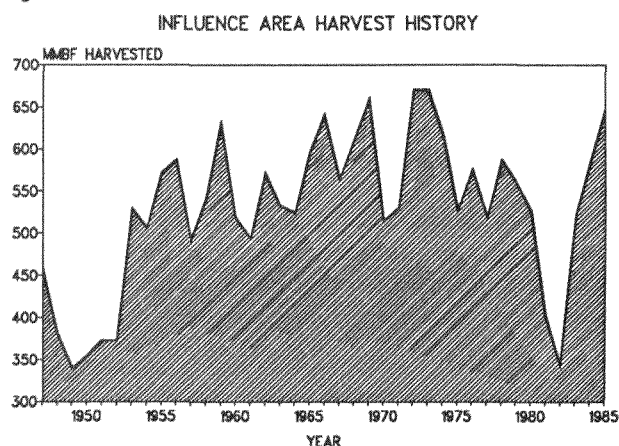
Price relationships have been a major factor in the loss of markets for northwestern wood. Douglas fir and ponderosa pine have gone up in price relative to southern pine, enabling southern producers to capture markets traditionally dominated by northwestern timber. Canadian producers have captured other segments. The explanations for this development may be argued, but Canada appears poised to increase its current 30 percent of U.S. lumber markets and maintain its share of the pulp products markets.

^{1/}Figures are 1984 average annual number of employees for SIC codes 08, 24, and 26.

^{2/} State of Oregon Employment Division.

Housing as a demand factor accounts for 40 percent of U.S. lumber and pulpwood consumption. Due to deregulation of thrift industries, rising costs of land, fuel, and materials, a shift to smaller families, and local restrictions on developers, housing starts are not expected to reach the levels of 1970-1980. A favorable situation exists in the western housing industry which is dominated by northwest wood products. In this decade, 25 percent of all housing starts are projected for the West, especially California, Arizona, and the Rocky Mountain states. If these starts materialize as projected, they will provide a good regional market.

Figure III-4



Historical dependence of wood products and their cyclical changes in supply and demand have made the smaller communities in the Influence Area especially sensitive to fluctuations in the national economy. The roller-coaster effects of the changes shows dramatically on Figure III-4. It also shows that in the past 10 years major owner harvests have fluctuated from 670 MMBF in 1972 to 343 MMBF -- virtually a 50% drop -- in 1982. During the period 1973 to 1982, the Forest's harvests ranged from 409 MMBF to 195 MMBF respectively.

Not only have timber harvests fluctuated, capital substitution and technological innovations have also reduced employment per unit of wood products processed. In 1950, eight employees were used to produce a million board feet of timber in Western Oregon. In 1970, four were needed. Employment in veneer plants fell from 14 to 8 persons per million square feet. Even more dramatic was the drop in employment in the paper industry. In 1958, 5.1 employees were employed to produce one thousand tons of paper; in 1970, the figure was 1.4.

The mix and total number of wood-processing facilities in the Influence Area have changed in response to market demand, timber supplies, technology, and cyclical changes in the national economy. The accompanying tables III-18 through III-20 summarize these effects.

Table III-18

1972 Wood Processing Facilities

COUNTY	SAWMILLS ALL CLASSES	SAWMILL CLASSES D C B A	VENEER & PLYWOOD	PULP	BOARD MILL	SHAKE & SHINGLE	EXPORT FACILITIES	POST, PILING
Clackamas	19	7 6 2 4	3	3	0	2	0	0
Hood River	3	0 0 0 3	0	0	1	0	0	0
Multnomah	6	1 1 2 2	4	0	0	2	6	3
Wasco	2	0 0 1 1	0	0	0	0	0	1
TOTAL	30	8 7 5 10	7	3	1	4	6	4

Table III-19

1982 Wood Processing Facilities

COUNTY	SAWMILLS ALL CLASSES	SAWMILL CLASSES D C B A	VENEER & PLYWOOD	PULP	BOARD MILL	SHAKE & SHINGLE	EXPORT FACILITIES	POST, PILING
Clackamas	11	4 2 1 4	0	3	0	2	0	0
Hood River	2	0 0 1 1	0	1	1	0	0	0
Multnomah	2	0 2 0 0	1	0	1	1	10	0
Wasco	3	0 0 2 1	0	0	0	0	0	0
TOTAL	18	4 4 4 6	1	4	1	3	10	0

Table III-20

Change in Number of Facilities 1972-1982

COUNTY	SAWMILLS ALL CLASSES	SAWMILL CLASSES D C B A	VENEER & PLYWOOD	PULP	BOARD MILL	SHAKE & SHINGLE	EXPORT FACILITIES	POST, PILING
Clackamas	-8	-3 -4 -3 0	-3	0	0	0	0	0
Hood River	0	0 0 -1 -2	0	+1	0	0	0	0
Multnomah	-4	-1 -1 -2 -2	-3	0	0	-1	+4	-3
Wasco	+1	0 0 -1 0	0	0	0	0	0	1
TOTAL	-12	-4 -3 -1 -4	-6	+1	0	-1	+4	-3

From Howard, Or. Forest Products Industries 1972, 1976, 1982
- PNW, Portland

^{1/}Class A mills = 120,000 + Board foot capacity per 8 hour shift
Class B mills = 80,000-119,999 Board foot capacity per 8 hour shift
Class C mills = 40,000-79,999 Board foot capacity per 8 hour shift
Class D mills = less than 40,000 Board foot capacity per 8 hour shift,

^{2/} Since this data was gathered the demand for wood products has strengthened and some mills have reopened.

Declining employment in adjacent communities that rely on the wood-products industry has been offset to some degree by increased opportunities in service industries, especially tourist-related industries. This offset, however, does not compensate for the impact of job losses and dislocation of individuals, families, and the social fabric of affected communities. High unemployment currently exists in the timber-related industries, several mills have closed, and market trends exert pressure for employers to seek wage

give backs and benefit reductions. Planning for the Forest and its relationships to nearby communities must take into account both present and future trends in timber management because a number of communities in the Influence Area continue to rely on wood as their main source of income. Loggers, mill workers, local businesses, and governments depend on revenues generated by product outputs of one or more local mills. When cutbacks or closures hit the community, retail firms, service businesses, and public agencies lose revenue leading to further layoffs. Dislocated workers must choose between living through the cutback and looking for work elsewhere. Such adjustments can be especially damaging to older workers who may face restructuring their lifestyles or even loss of independence. Various studies suggest that plant closures can increase mental and physical problems including such disorders as cirrhosis and heart disease.

2. Range Management

a. Background

Domestic livestock, such as cattle or sheep, are permitted to graze on the Forest's grass and leafy plants called forbs. These plants are palatable as well as nutritious to livestock, and as forage they provide a spring and summer range for small ranchers who live near the Forest.

b. Existing Situation

Range on the Forest is classified as permanent or transitory. Approximately 6,000 acres representing about 1/2% of the Forest's land are considered permanent range producing a continuous source of forage suitable for grazing. The amount of transitory range changes over time to reflect Forest conditions. Trees cover most of the Forest, especially at middle and lower elevations, shading out grass and forbs. However, timber harvesting by clearcutting permits grass, forbs, and shrubs to grow on the cleared site until the overstory once again stops forage plants from growing. Forage for grazing livestock is normally available in clearcuts from 10 to 30 years following timber harvesting.

In 1983, the transitory range on the Forest was estimated at 76,000 acres. The combined acreage of this and permanent range exceeded the amount put into use. The main reason for non-use is the location of grazing allotments. Range for grazing is available on both sides of the Forest, but the demand for range is negligible on the west side. Grazing on the Forest fits well with the cow/calf ranching of the east side, but does not fit into agriculture as generally practiced on the west side. Transportation problems also contribute to the under-utilization of range on the west side. At this time, only 7 of 10 available allotments are active. No sheep range is under present allotment mainly be-

cause it is impossible to raise sheep profitably under current market conditions.

Permanent range areas on the Forest are presently rated in fair to good condition with an upward trend. Permanent range comprises such a small portion of the total range resource and Forest acreage that maintaining its condition is not a major management problem. Condition and trend ratings do not apply to transitory range because it is constantly being recycled under timber-management procedures. The following table displays the class of livestock use, numbers of animals grazed, and the amounts of forage utilized on the Forest during the 1985 grazing year. An animal unit month is the amount of forage eaten by a 1,000 pound steer or cow in 30 days. This can be adjusted for other classes of livestock by applying a conversion factor. Suitable acres is a term to describe land actually in forage suitable for grazing.

Table III-21

KINDS OF LIVESTOCK	1985 PERMITTED GRAZING USE		
	NUMBERS OF LIVESTOCK	ANIMAL UNIT MONTHS (AUM)	SUITABLE ACRES
Cattle	1,510	8,708	75,090
Sheep	0	0	0
Vacant allotments			7,895
TOTALS	1,520	8,708	82,895

c. Relationship to the Natural Environment

Cattle can create a water quality problem if they are allowed to gather closely near streams. They can trample stream banks, and cause them to crumble into the water or erode. Damage to deer and elk range can occur around watering areas. Cattle grazing where young trees are growing can cause damage by trampling seedlings or rubbing against older trees. This kind of damage is usually found where cattle congregate, as at watering places or near shady spots used by livestock for resting areas. However, this is usually not an extensive problem, nor a significant factor that affects the compatibility of grazing and timber management.

Within timber management areas, harvesting can stimulate the growth of grass and forbs which enhances the quality of the range for grazing livestock. As noted, however, grazing capacity will diminish and ultimately disappear when the trees grow large enough to shade out forage plants.

Environmental degradation caused by grazing livestock is relatively simple to prevent or minimize. Streambanks can be fenced, pastures rotated, or herding requirements added to allotment grazing plans. Fencing two streams in the Rocky burn proved effective in mitigating grazing impacts

on water quality. Fencing a pond or spring and piping water to a stock watering tank has been used to control livestock damage to elk and deer range. The fence does not affect wildlife as deer can jump the fence, and birds and small mammals will go over, through, or under the fence.

Competition between cattle, elk, and deer for forage on big-game winter range is another matter. Limiting the cattle permitted on the allotment, and limiting grazing to early spring periods when other grasses and forbs are most lush and palatable to cattle, can minimize this competition. Spring grazing encourages cattle to selectively graze on the grasses and forbs and leave the shrubs for deer and elk. Early spring grazing has to be watched carefully because cattle can compact the soil if allowed on wet and susceptible areas. Other measures like rotating pastures at frequent intervals can control the problem of wet-range allotments.

Interactions with other aspects of the natural environment are localized and do not present serious impacts.

d. Relationship to the human environment.

Livestock grazing on specific land allotments occurs concurrently with timber management. Therefore grazing allotments change according to the patterns of timber harvest and reforestation.

Permittee livestock operations on the Forest vary in size from 800 to 60 heads of cattle per permit. Nearly all permittees depend on the Forest to furnish them spring and summer grazing lands for their livestock. Without this Forest range, many permittees would either go out of the livestock business or be forced to cut back their operations substantially. Ten permittees currently hold grazing allotments on the Forest in which they feed about 1,500 head of cattle from May 1 to September 30 each year.

Considering the needs of all residents of counties near the Forest, grazing is of less significance than many other forest uses. However, range permits can make the difference between some east-side individuals paying their bills or going broke. A typical east-side rancher has a small operation raising wheat and perhaps 165 head of cattle. A common practice is to sell calves in the fall and graze cows during the winter on wheat-stubble fields. Most ranches are family-operated businesses and, more often than not, the owners' sole source of income. Should grazing be excluded from Forest activities, these families would be hit hard, but the rural communities on the east side of the Forest would not be financially affected to any great degree.

At present, problems with livestock having a significant impact on the Forest's resources occur on less than 10% of the acreage in individual allotments. Grazing allotments that create a negative impact on resources are termed

"problem allotments," but there are none so classified on the Forest at this time. However, a problem does exist in the lack of balance between supply and demand. On the east side, the demand is strong but little additional range capacity is available. On the west side, allotments are available but they go unused. Overall, the projected demand for grazing permits is for a slow, steady upward increase over the next ten years. Any additional opportunities for grazing identified on the east side will probably be met by demand.

e. Management Concerns

One goal of range management is to maintain all rangelands in a healthy, productive condition while eliminating or minimizing damage to other environmental resources. Steps to achieve this goal are:

- (1) Balance livestock grazing with other resource needs.
- (2) Use range-management methods designed to achieve uniform distribution of livestock and proper uses of forage.
- (3) Provide needed facilities, high-quality forage, and controls on livestock movement by methods like the development of stock watering areas, building fences, and seeding desirable forage species.

A special management concern, shared with adjacent landowners and Oregon state officials, is the control of noxious weeds. Efforts are guided by the Mt. Hood Noxious Weed Control Plan developed jointly between the Forest and the Oregon State Department of Agriculture. The highest priority has been assigned to controlling tansy ragwort which poisons cattle. Knapweed is the most prolific weed, and Canadian thistle is becoming a problem. All noxious weeds tend to crowd out desirable forage. They are spread by human activities such as road building and logging, and by natural events such as fire. The Forest cooperates with the Oregon State Department of Agriculture, and local weed-control organizations in the fight against noxious weeds. Funding of the program originates from timber sale area improvement planning, using Knudson Vandenburg (KV) funds, and from direct appropriated funds.

3. Timber Management

The Forest's timber management program is built on two interacting elements, demand and supply. The use of wood in many products creates the demand for timber harvests, and generates the expectation of certain publics that the National Forest System should supply a proportionate share of timber and other forest products. A forest's potential timber supply depends upon the forest's ability to grow trees of the desired size and species. This discussion of the demand and supply factors in timber management will take up each factor as related to national, regional, and local trends. Information on timber demand and supply as

these impact nearby communities may be found in the section of this chapter headed Communities.

a. Demand.

Extensive research has been conducted into the problem of projecting future demands for wood products. Results are far from conclusive; nevertheless, many factors that affect demand have been identified. Some of them are:

- Population growth
- Consumer purchase patterns
- Economic growth
- Interest rates
- Processing technology
- Energy prices
- Substitute products
- Changes in export markets
- Competition from imports
- (National/Regional)

(1) *National demand perspective.* The Forest and Rangeland Renewable Resources Planning Act requires a periodic assessment of the demand for timber along with other resources. The most recent assessment made in 1984 projected continued growth in timber demand. It said, in part:

A substantial part of the projected increase in softwood timber demand takes place by 1990. This is in response to an expected surge in homebuilding in the last half of the 1980's as the large number of people born during the 1950's and 1960's seek their own place to live. Pent-up demands resulting from the recent low levels of housing construction will also contribute to the surge in housing in the late 1980's. However, even beyond the 1980's, softwood timber demands continue to rise and by 2030 will be some 1.4 times consumption in 1980. (USDA 1984)

The U.S. Department of Commerce arrived at a somewhat different outlook:

The long term outlook for the solid wood products industries is changing. Evidence is mounting that timber demand probably will fall short of earlier expectations. (U.S. Department of Commerce 1983)

Although the outlook is apparently uncertain, the forest planning process is flexible. Changes can be accommodated as they arise, and revisions in assessed demand will be reflected in future revisions of the Proposed Forest Plan, accompanying this DEIS.

(2) *Regional demand perspective.* In looking at timber demand from the viewpoint of the Pacific Northwest, one sees a number of challenges. Evaluation of recent data and information indicates that the demand for regionally-

produced timber is changing to a moderate rate of increase as compared to the slowdown that marked the early 1980's.

Sustained demand in the future will depend primarily on continuing high rates of personal income and on the availability of affordable housing and mortgage money. Other factors include: lack of substitutes for lumber, controls on supplies of timber, and continued or increased supplies from U.S. National Forests. In addition, projections for exports to the Pacific Rim countries continue to show slow growth. The analysts acknowledge there will be declining trend in the construction sector as structure replacement, rather than new construction will characterize this market. The projections for increases in demand may be described as considerably restrained and cautious. The conclusion, therefore, is that over the next decade timber demand from the Pacific Northwest will grow slowly.

The short-term future of demand for timber and wood products is clouded by such factors as the severity and length of the housing and wood-products recession that began in 1980. Other factors also contribute to a potential shift in future demand. These include long-term trends in housing demand, the growing popularity of construction methods which use less wood, the availability of wood substitutes, and a shift in business management strategies and methods (Haynes and Adams 1985). The ability to sustain projected regional increases on a long-run basis is linked to the critical issue of costs, and whether producers can lower costs to be competitive with wood substitutes (Schallau 1986).

The Pacific Northwest region may better utilize the opportunity to increase exports by developing a flexible, regional basis for stabilizing wood supplies. This would involve changes in the current market system, and would provide more products in the form demanded (Campbell, et al, 1983). Actions by the industry, such as modernizing facilities, adopting state-of-the-art technology, reducing costs, and diversifying into other sectors of production could help to rebuild and stabilize the wood-based sectors of the region (Schallau 1985).

(3) *State of Oregon.* An Oregon State University, School of Forestry research bulletin published January 1976, examined the future role of public forest lands in the State's economy as part of an overall estimate of the State's ability to produce timber. Two objectives of this research were to determine whether current statewide harvest levels could continue to be maintained, and whether the state's proportional share of national supplies could be maintained if national demand increased. The conclusions were affirmative provided the amount of timber to be supplied by the National Forests in Oregon would increase. Recognition that the stability of Oregon's wood-products industry depends, to a significant degree, on timber supplied by National Forests has stimulated demand for increased em-

phasis on timber management on the Mt. Hood National Forest.

The "Forestry Program for Oregon" (FPFO) is a document periodically updated and published by the Oregon State Board of Forestry. Members of the Mt. Hood National Forest have worked with Board members to desegregate FPFO state-wide objectives to the Forest. This can be viewed as a statement of demand by the State Administration as of the last date (May 1982) the FPFO was revised. Part Three of Chapter II of this DEIS includes a discussion of the relationship between this demand and the supply of timber provided by various alternatives.

(4) *Mt. Hood National Forest.* Timber harvest targets were assigned to the National Forests based on the RPA Assessment of the National demand. The Forest's share of national production was set at 376 million board feet per year through the year 2030. This RPA target is close to current harvest levels.

At the purely local level, the demand for timber directed to a single producer, such as one Forest, is affected by local alternative sources of supply. These supplies may come from other Forests or agencies, or from private lands. At the Forest's individual level, buyers of its timber require a reliable supply to assure continued mill production in order to make reasonable business investments. Sustained high interest in bidding for the Forest's timber reflects continuing demand in spite of cloudy long-term forecasts. Low log prices have at times made harvest of purchased timber unprofitable. For example, in FY 1985 a total of 1,500 MMBF of sold timber remained uncut.

b. Supply.

(1) *National trends.* The main source of projections used in developing long-range plans and programs for the management of the National Forests is the Forest and Rangeland Renewable Resources Planning Act (RPA) Assessment and 1984 Update. As these projections focus on the long-term (50 year) supply of timber, they do not necessarily incorporate short-term fluctuations within the various regions. Projected RPA trends for timber supplies (year 2030) include the following summary for softwood timber:

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

In the Douglas-fir subregion, projected annual harvest from 1980 to 1990 is about 2.3 billion cubic feet. It then declines slightly to about 2 billion cubic feet per year. This level is roughly maintained through the rest of the 50-year projection period. (USDA 1984)

In contrast, the other major source of softwood timber harvest is the South, which is projected to rise from about 4.1 billion cubic feet in 1980 to 7.3 billion in 2030. Currently, part of the timber formerly supplied by the Pacific Northwest region is also being supplied by Canada. However, the situation with Canada can be expected to change as there are indications that the economic supply may begin dropping off within 6 years or at least by 15 years. The projected change indicates a potential drop in supply capability of 30 to 50 percent from the current relatively high levels.

Overall current timber supply levels in the Pacific Northwest may be able to meet future demand, but problems within subregional market areas need to be recognized. Problems include a shifting of industry within the region, a shifting of emphasis on types of wood products produced, and the ability of the subregion to supply the specific kinds of wood needed.

The South should be able to maintain or show a slow increase in harvest because of its remaining inventory and some substitution of hardwoods. However, most recent forecasts are now showing a downward modification in the rate of economic supply. This may indicate that the South could be expected to be shifting to a slower rate of increase above present levels, until the year 2030. Much of the current expansion in the South with softwoods, as well as hardwoods, is due to the fact that its wood products production has become more diversified as compared to other regions of the country.

(2) *Private/public land interrelationships.* At about the same time a drop in the non-regional supply capability begins to take place, the growth of wood fiber on private lands in the Pacific Northwest would again be reaching the capability of supplying major quantities of softwoods to meet national and international demands. In the period before private lands in the region regain their full supply potential, public forests would be looked upon as a relatively stable, major source of wood fiber.

Table III-22 displays data reflecting timber removed by different landowners between 1977 and 1984 from the 4 county Influence Area. The data is separated into two periods with vastly different market situations. The decline in timber supply between the two periods, by supplier, is displayed at the bottom of the table. These figures show that 69% of the decline in timber supply was from private industry sources, whereas the National Forest dropped their timber supply by 6%.

Table III-22

Timber Removed from the Mt. Hood Influence Area

SUPPLIERS								
COUNTY	FOREST INDUSTRY	OTHER PRIVATE	STATE	BLM	NATIONAL FOREST	INDIAN	OTHER PUBLIC	TOTAL
Period 1977-1980: (average annual MMBF)								
Clackamas	81.5	13.4	2.5	25.3	188.7	0	0	311.4
Hood River	10.4	0.9	0	0	36.0	0	7.7	55.0
Multnomah	6.2	2.0	0	0	22.8	0	0	31.0
Wasco	6.2	4.9	0	0	52.2	88.6	0.1	152.0
Total	104.3	21.2	2.5	25.3	299.7	88.6	7.8	549.4
Period 1981-1984: (average annual MMBF)								
Clackamas	32.4	11.9	1.9	25.6	184.1	3.4	0.3	259.6
Hood River	6.5	0.4	0	0	25.2	0	6.6	38.7
Multnomah	5.6	2.1	0	1.0	14.9	0	0	23.6
Wasco	1.2	4.3	0	0	70.1	67.0	0.1	142.7
Total	45.7	18.7	1.9	26.6	294.3	70.4	7.0	464.6
Differences between 1977-1980 and 1981-1984 Averages (all four counties)								
MMBF/year	-58.6	-2.5	-0.6	+1.3	-5.4	-18.2	-0.8	-84.8
% Difference	-69%	-4%	-1%	+2%	-6%	-21%	-1%	100%

The declines in timber supply depicted in the preceding table correspond to projections of possible changes in future timber harvests in the North Willamette Valley Timbershed Oregon made in a 1976 study conducted by the School of Forestry at Oregon State University.^{1/}

This study projected that the "The result under current policies and actions would be a decline of 30 percent in the timbershed harvest by the third decade." Assuming that this translates to an average decline of 10 percent per decade and the decline displayed in Table III-24 continues for each supplier for the next five decades; the following table portrays the projected potential timber harvest that can be expected from suppliers in the Mt. Hood Influence Area.

Table III-23

Projected Potential Timber Harvest from Mt. Hood Influence Area (Average MMBF/yr)

PERIOD	PRIVATE	STATE, AND OTHER PUBLIC	BLM	NATIONAL FOREST	INDIAN	TOTAL
1986-1995	58.0	8.0	23.9	264.9	63.4	418.2
1996-2005	51.1	7.2	21.5	238.4	57.0	376.3
2006-2015	46.9	6.5	19.4	214.5	51.3	338.6
2016-2025	42.3	5.8	17.5	193.1	46.2	304.9
2026-2035	38.0	5.3	15.7	173.8	41.6	274.4

Table III-24 below projects how much timber the Mt. Hood National Forest would have to supply to maintain the average annual total amount of timber produced from the four-county Influence Area produced between 1981 and 1984, given that other suppliers continue to supply timber at the 10 percent rate of decline projected above, i.e. 364.4 million board feet (See preceding Table III-22).

^{1/} Timber for Oregon's Tomorrow, an analysis of Reasonably Possible Occurrences, by John H. Beuter, K. Norman Johnson, H. Lynn Scheurman. Research Bulletin 19, January, 1976. Forest Research Laboratory, School of Forestry, Oregon State University, Corvallis, Oregon.

Table III-24

Amount of Timber Supplied from Forest to Four-county Influence Area to Maintain Supply at Average Annual Amount Produced Between 1981 And 1984 (MMBF/yr)

PERIOD	SUPPLY FROM OTHERS (GIVEN 10% RATE OF DECLINE PER DECADE)	AMOUNT NEEDED FROM FOREST TO MAINTAIN CONSTANT TOTAL	TOTAL
1986-1995	153.3	311.1	464.4
1996-2005	137.9	326.5	464.4
2006-2015	124.1	340.3	464.4
2016-2025	111.8	352.6	464.4
2026-2035	100.6	363.8	464.4

Other scenarios can be projected that reflect an overall average annual timber volume of 464.4 million board feet being produced from the Influence Area. Some of these could project varying decreases in supply of timber from the Forest, or varying amounts from the other supplies. If the National Forest's contribution were to decrease, other suppliers such as private industry, or the Warm Springs Indian reservation, would have to increase their production of timber. However, based on the projections in the study cited above, and the fact that private industry has recently harvested their lands to the extent that increases in timber production is unlikely during the next 50 years; the scenario displayed in the table above is the most likely.

The Warm Springs Indian Reservation may be capable of increasing production since their draft comprehensive land management plan^{1/} indicates the Reservation has a substantial amount of standing timber volume within the portions of the McQuinn Strip^{2/} within Wasco County. However, this plan makes it clear the timber to be produced from the McQuinn Strip will be processed in the Tribal owned mill in Jefferson County outside of the Forest's Influence Area.

(3) *Mt. Hood National Forest Timber Supply.* The ability of the Forest to provide timber is limited by a number of factors. The most important are:

- The amount of area on which timber can be managed.
- The amount of standing timber.
- The rate of growth for new timber stands following harvest.

Approximately 60% of the Forest's total lands are suitable for timber production. In accordance with 36 CFR 219.4, the unsuitable strata of acres were screened out through a complex process. A summary of the screening results

^{1/} Warm Springs Reservation Comprehensive Plan, Confederated Tribes of the Warm spring Reservation. 1984.

^{2/} An area of 79,000 acres between 1871 and 1887 survey lines of the west boundary of the Warm Springs Indian reservation that has reverted to Tribal ownership as a result of 1971 laws.

is provided in the accompanying table. For additional information, see Appendix B, and a paper entitled "Determination of Land Not Suitable for Timber Production," Mt. Hood N.F., July 1984.

The 647,118 acre total is considered tentatively suitable, and was the basis for development of all alternatives except NC. That alternative is based on the 656,000 acres in the current timber management plan.

Table III-25
Lands Tentatively Suitable for Timber Production^{1/}

	NOT SUITABLE FOR TIMBER PRODUCTION	REMAINING TENTATIVELY SUITABLE
I. Total National Forest Area		1,100,713
A. Other Ownerships	41,274	
II. Net National Forest Area		1,059,439
A. Water (Lakes and Streams)	14,441 Screen I	
B. Non-Forest (not stocked with 10% tree cover)	189,880 Screen I	
C. Lands developed for other than timber production purposes (crops, improved pasture, residential, administrative areas, improved roads, powerline clearings)	22,877 Screen I	
Subtotal Screen I	227,198	
III. Forested Lands		832,241
A. Withdrawn from Timber production (219.14(a)(4))		
1. Wilderness	118,659 Screen II	
2. Research Natural Areas	1,194 Screen II	
3. Other such as Wild and Scenic Areas, Experimental Forests (listed by reason)	7,487 Screen II	
Subtotal Screen II	127,340	
Subtotal		704,901
B. Irreversible Resource Damage (219.14(a)(2))	28,220 Screen III	
C. Regeneration Difficulty (219.14(a)(3))	28,177 Screen IV	
D. Lands Growing Less Than 20 ft./ac./yr. 3		
1. Lands classified as unsuitable	1,386	
2. Lands classified as suitable	0	
3. Lands classified as separate suitability component	0	
E. Regeneration Difficulty Lands Classified as a Separate Suitability Component	0	
IV. Tentatively Suitable Forest Land	(a) 0 (D2,D3+E) 412,321	(b) 647,118
V. Totals of Suitable and Nonsuitable Lands		647,118 (a)+(b) 676,502
VI. Suitable and Nonsuitable Summary Approved for Forest Planning Prior to Chief's Letter of July 15, 1983.		
VII. Land Status under Current TM Plan	403,350	656,000

Land tentatively designated suitable for timber management, and the present standing inventory by timber-productivity group, is summarized in the next map and the accompanying table. The amount of land is specified in acres. The Douglas-fir working group corresponds to the Western Hemlock Zone, the true fir group corresponds to the

Table III-26
Timber Volumes by Working Groups

WORKING GROUP (MAJOR TIMBER SPECIES)	ACRES IN THOUSANDS	VOLUME IN MILLION CUBIC FEET	VOLUME IN MILLION BOARD FEET
Douglas fir (Douglas fir, w. hemlock, red cedar)	407	2,500	12,800
True Fir (true fir, Mt. hemlock, Englemann spruce)	114	770	3,900
Associated species (Douglas fir, Ponderosa pine, White fir)	111	560	2,800
Pine/Oak (Ponderosa pine, Douglas-fir, Oregon white oak)	16	60	300
TOTALS	647	3,920	19,900

Pacific Silver Fir Zone, the ponderosa pine group corresponds to the Ponderosa Pine Zone, and the associated species group corresponds to the Grand Fir Zone.

As shown in the next table, older trees predominate in the Forest.

Table III-27

Tentatively Suitable Timberlands by Age Group

AGE	ACRES IN THOUSANDS	PERCENT OF SUITABLE TIMBERLANDS
0-10	57	9
20-60	127	20
70-120	30	5
130-190	139	21
200+	294	45
Totals	647	100%

Although the Forest's supply of mature sawtimber seems relatively abundant, the Analysis of the Management Situation has shown that the levels harvested in recent years cannot be maintained indefinitely (reference Appendix B). Updated data in the Analysis takes into account changes in the land base, inventory, and productivity which occurred after the present allowable cut levels were established.

If all tentatively suitable acres could be managed for maximum timber yield, the highest timber volume sustainable over time would be 68 MMCF/year (348 MMBF/year, first decade ASQ). The reduced production compares to the potential production of 384 MMBF stated in the current Timber Management Plan. The Forest could continue to offer the present volume for sale in the short term because it has large amounts of old standing timber.

Only chargeable harvest of timber can be planned with any certainty. (See glossary). This is the projected volume when models are used to determine the growth of tree species and their response to management activities. Other timber of commercial value may be available in the future, but not in assured amounts. Such volume might include, for example, salvage of dead trees, or removal of timber on lands designated not suitable because of the needs of other resources. This volume is termed nonchargeable, and has been roughly estimated in comparing the alternatives in Chapter II. Total timber volume (Total Program Sale Quantity on TPSQ) is the sum of chargeable and nonchargeable volume.

As the accompanying graph shows, the total volume produced on the Forest did not show sharp increases prior to World War II. Then production climbed through periods of sharp fluctuations. Volume remained substantial and without sustained and serious decreases until the recession of 1981.

WORKING GROUPS

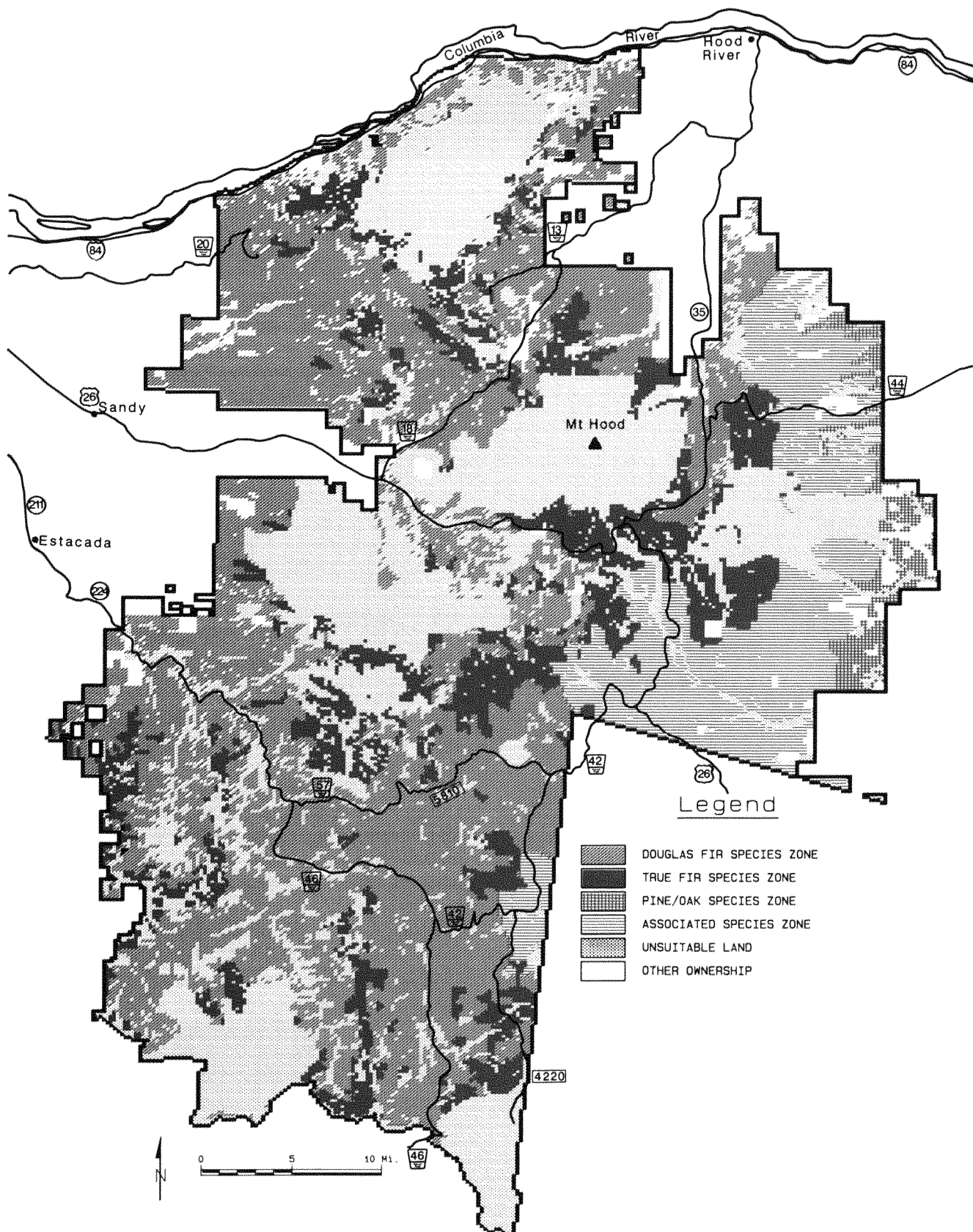
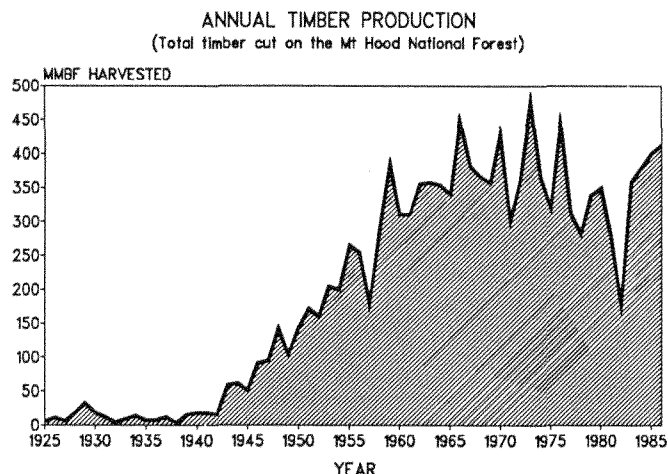


Figure III-5



The annual amount of timber actually cut, as displayed in Figure III-5 above, differs each year from the amount of timber sold. Figure III-6 below depicts the difference between the amount of timber *sold* each year between 1977 and 1986 and the amount of timber actually *cut* during this period.

The average amount of timber cut each year during this period has been about 40 million board feet less than the timber sold, an average difference of 12 percent. Industry did not cut all the timber it purchased primarily because the demand for wood products was not as high as the amount of timber available for harvest. This may have been due in part to high interest rates and a recession on the general economy that occurred during the period displayed in the accompanying graphs (refer to the following discussion on timber supply).

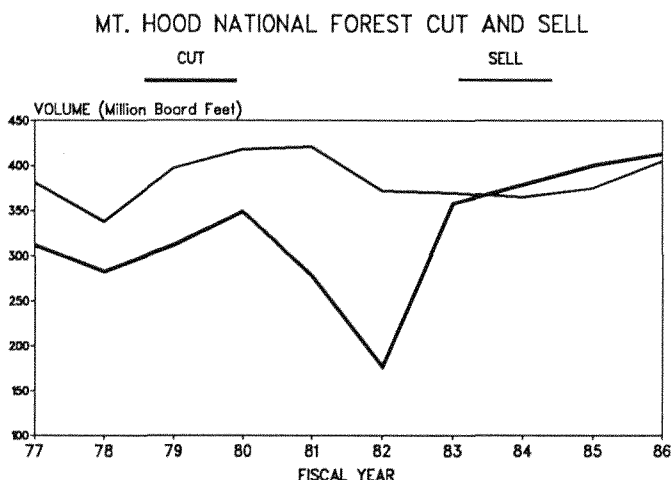
c. Relationship to the Natural Environment

Management of the Forest's timber resources may have a greater overall impact on the biophysical environment than any impact produced from any other activity. Road construction directly connected with timber management noticeably changes the environment. These changes may not always be permanent, but they last a long time. The effect of timber production on each aspect of the environment is discussed in detail in the sections of Chapter IV which take up timber and how it affects each resource. Its main impact may be summarized as follows:

Some animals, like deer and elk, benefit from clearcutting if the openings are not too large. Populations of other species which depend on old growth will decline as mature trees are removed. The issue is complex. For instance, preserving viable populations of some smaller species of wildlife could limit the harvest of old growth. Deer and elk have other requirements. The proper relationships between the amount of cover provided by stands of mature

timber, and the amount of forage available in natural and created openings, are considerations in the design of timber sales.

Figure III-6



Slash left by precommercial thinning causes problems for deer and elk when they travel through plantations. However, the thinning that causes problems for deer and elk is helpful to small mammals and birds which use the slash for cover. The section in this chapter on wildlife provides further details on the interactions between wildlife and timber.

When timber harvesting compacts the soil, it accelerates water runoff with resulting damage to riparian resources. The infestation of weeds is increased by road building and logging. Weeds crowd out desirable forage plants.

The whole ecology of a forest can be affected by fire. Natural ecological succession is renewed by wildfire which in the process may damage mature trees valuable for lumber. Logging slash often must be burned to reduce fire hazards and regenerate desirable species for timber. The section on fire in this chapter provides additional information on this subject.

Any ground-disturbing activity, such as those associated with timber harvesting operations, can damage the environment of sensitive plants. However, most species of sensitive plants grow in nonforested areas like meadows, wet sites, bogs, talus slopes, dry cliffs, grasslands, dry alpine sites, pumice areas, and rocky sites. Since timber harvests are unlikely in these sites, the impact of timber management on sensitive plants is minimal.

d. Relationship to Human Environment

(1) *Communities.* Many mills in small communities within the Forest's Influence Area rely on the Forest for much of their supply of timber. (Section 4 of Appendix B provides additional information.) A million board feet of lumber provides jobs for about four logging/sawmill workers, plus additional indirect or induced employment. The accompanying chart shows the importance of the timber resource to communities nearby.

Table III-28

Volume of Mt. Hood National Forest Timber Processed in Nearby Mills

PROCESSING LOCATION	VOLUME MILLION BOARD FEET	COUNTY
Oregon City, Molalla area	130.5	Clackamas
Maupin	44.0	Wasco
Estacada	23.0	Clackamas
Boring	22.9	Clackamas
Portland	17.1	Multnomah
Hood River area	14.3	Hood River
Tygh Valley	11.7	Wasco
Other	76.8	Clatsop, Columbia, Deschutes Lane, Linn, Lincoln, Marion, and Skamania counties
TOTAL VOLUME	340.3 million board feet	

Section 4 of Appendix B, contain additional data on the demand for Forest timber and the economic impacts of the Forest's timber-management program. In the past two years, demand for Forest timber has strengthened, and the cut has correspondingly increased. This recent change, as well as changes in other years, has a special impact on adjacent communities due to payments in lieu of taxes to counties from timber sales receipts.

Payments to counties from timber sale receipts normally account for approximately 90 percent of the total payments from National Forest Receipts. Refer to discussion and Tables III-15 and III-16 on page

Based on the figures in Table III-15, if the average chargeable timber sell during fiscal years 80 to 84 was 384 million board feet (see Figure III-6), a coefficient can be calculated that indicates that for every million board feet of timber cut in the past on the Mt. Hood National Forest counties in the Influence Area have received the following payments:

- Clackamas County approximately \$12,000
- Hood River County approximately \$5,000

- Wasco County approximately \$5,000
- Multnomah County approximately \$1,700
- Marion County approximately \$1,500
- Jefferson County approximately \$100

(2) *Firewood.* Many people living near the Forest consider the availability of firewood a special issue. Local demand for firewood by the public has increased to the point that permits for fuel-wood gathering which were only 2,800 in 1975, reached 13,100 in 1984. The accompanying table shows the number and percent of housing units heated with wood exclusively. (Source 1980 census.)

Table III-29

Total of Homes Heated, and Heated by Wood Only

COUNTY	TOTAL HEATED UNITS	WOOD HEAT EXCLUSIVELY	PERCENT
Clackamas	84,698	9,701	11.45
Wasco	8,212	962	11.71
Multnomah	233,135	6,980	2.99
Hood River	5,962	1,056	17.70
Totals	332,007	18,699	5.63
STATE	991,593	123,789	12.48

These figures reveal only a part of the demand for firewood. They do not show the homes heated primarily with wood but using another system as a backup. Present supplies of firewood come primarily from slash/residue left after logging mature to old-growth stands. As older, more decadent stands are logged over, this source will diminish, and other sources will have to be explored if an acceptable supply is to be made available.

Firewood availability can be increased in many ways within current Forest policy. Possibilities include:

- Make green material like lodgepole and alder available.
- Do limited precommercial thinning (pole-sized green material).
- Issue contracts to move wood from sites inaccessible to the average woodcutter to accessible locations.
- Where quality or species of trees are unacceptable for sawlog production, set aside areas for firewood cutting.

If firewood management is to meet a continuing demand at present or higher levels, serious consideration of set-asides and other firewood programs will be necessary.

(3) *Other Human Factors.* Roads used by visitors to the Forest, and for other purposes, are most often built with funds derived from timber sales. The section on transportation in this chapter provides additional data about this subject.

Although some recreational activities go on where timber has been harvested in the past, logging and recreation are not normally compatible. Managing for scenic quality, for example, will restrict timber harvests. Similarly, areas designated Wilderness, Special Interest, and Research Natural Areas preclude timber harvesting although knowledge gained from RNA's will likely be useful in managing the timber resource. Road building to harvest timber in a roadless area would destroy its primitive character.

On the Forest, forage made available through timber harvesting is an important component of range allotments.

e. Management Concerns

(1) *Existing Commitments.* The Forest is presently committed to long-term, sustained yield of forest products along with the protection of other resources. In many sales, harvesting techniques have been restricted to those with the least impact on the environment. Harvest has been prohibited in areas considered suitable for timber management because they are sensitive areas with other resource values. Present harvest levels could not be continued for long unless some of the present considerations of other resources are modified or discontinued.

(2) *Costs and Benefits of Timber Sales.* The accompanying chart shows the relative frequency of timber harvests, and relative prices paid for the Forest's timber. The chart does not show hardwoods such as big leaf maple, black cottonwood, Oregon white oak, and golden chinkapin because these have little commercial value at present. The question of below-cost timber sales reached Congress in 1984 when three reports (one each from the Congressional Research Service, the General Accounting Office, and the Wilderness Society) were issued charging that the Forest Service sells timber in areas where costs consistently exceed revenues. Critics argue that such areas should be identified as unsuitable for timber production. Others argue that cash flow analyses are unnecessarily restrictive measurements of timber sale

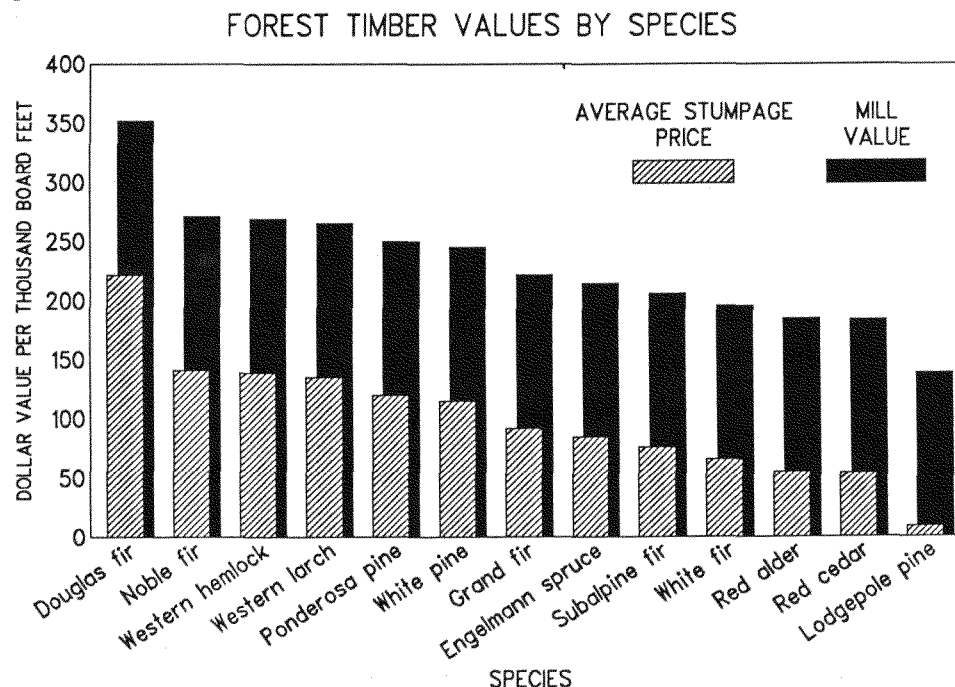
economics. Others point out that the use of silviculture to bring about non-timber objectives (such as thinning stands for wildlife or visual purposes) is necessary, but not as cost efficient as managing solely to maximize timber revenues. Historically, there have been few below-cost sales on the Forest because trees are generally large, volumes per acre high, and road building not especially difficult.

Exceptions to this rule include sales designed to meet multiple use objectives and salvage sales which occasionally cost more for administration, road building, slash disposal, etc., than their sales dollars. The rationale for such sales are numerous. The sale can be to remove dying trees before they become useless through rot or insect attack. Other reasons for salvage sales include preparing an area for replanting, controlling erosion, or reducing fire hazards.

Below-cost sales can also occur due to road construction. Roads into previously unroaded drainages are built with future sales as a planning factor. In other words, the total future road system enters into the placement and design standards of the first road in a drainage. Therefore, a rather small timber sale could be served by a road constructed to higher standards than would be needed to log that particular sale.

The present method used by the USDA Forest Service to keep records of timber sales does not lend itself to a financial analysis of individual sales. The following data summarizes timber program costs and benefits for a typical year.

Figure III-7 ^{1/}



^{1/} (RO Timber sale statement of accounts, 4/77 to 9/83).

- Value of timber offered ^{1/} \$39,924,000
- Cost of timber sales \$6,627,000
- Net value realized \$33,297,000

(3) *Regeneration Harvest Methods Available.* Timber management on the Forest currently employs four regeneration systems:

- (a) Selective cut.
- (b) Shelterwood.
- (c) Seed Tree.
- (d) Clearcut.

The objective of each system is to reproduce an existing stand, and/or create environmentally favorable conditions for re-establishing a new stand. Although Shelterwood and Clearcut are most often used, each system has advantages and disadvantages that help to determine which will be selected to meet a particular situation.

Both even-aged and uneven-aged regeneration harvest methods will be used. The determination of which methods is to be applied in a given situation will depend upon current land uses and will be guided by the selection criteria listed below. The identification of the commonly used regeneration harvest methods does not preclude using other methods as indicated by local circumstances and objectives. Even-aged harvest cutting methods will be the most commonly used in coniferous forests. Uneven-aged harvest cutting methods may be used when healthy, fully stocked, uneven-aged stands exist or can be created by identified treatments within a defined time period.

The selection criteria are:

- (a) 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.
- (b) 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.
- (c) 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.
- (d) 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.

(e) 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.

(f) The harvest cutting method selected must meet resource and vegetation management objectives identified in the Regional Guide and Forest Plan. Harvest cutting methods to be used on specific areas may be identified in the Forest Plan, in environmental assessments, or in silvicultural prescriptions that are written or reviewed by a certified silviculturist.

Also refer to the "Regional Guide for Pacific Northwest" (page 3-3) for detailed discussion of each criterion.

Silvicultural system selections take place at both the Forest and Ranger District levels. Most decisions are reached following a series of field verifications and from the modification and/or acceptance of a formal Silvicultural Prescription Recommendation. At Ranger District levels, a certified silviculturist writes or approves silvicultural treatments and system recommendations, which are then accepted or rejected by management at both District and Forest levels. Appendix B supplies further information about these procedures.

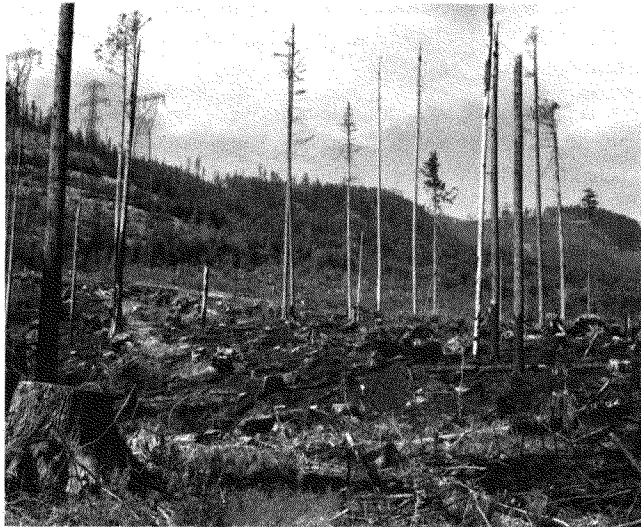
Clearcut: As its name implies, the Clearcut System calls for the removal of all existing vegetation at one time, however, only material that can be utilized, or sold, is operationally removed. Clearcutting includes establishing an even-aged plantation of new trees. Regeneration is generally artificial through planting, but natural regeneration can occur from adjacent stands, seeds in the duff layer, and from advanced regeneration within the area.

Several criteria apply to the consideration of a site for clearcut harvesting. If the management objective is timber production, a given site must contain a salable quantity of utilizable forest products, contain a total live-tree stocking either below or above a defined acceptable level, contain mature-crop trees in excess of recommended levels, be suitable for the control of competing vegetation, be suitable for the preferred regenerating species, and be reforested within an acceptable time period. Other management objectives such as wildlife habitat, recreation usage, or rangeland improvement, may change, modify, or eliminate one or more of the criteria to fit the particular needs of the sale's objective(s).

Clearcut harvesting is suitable for all portions of all species zones on the Forest except where local environmental conditions rule out, or greatly restrict, the ability to regenerate an area within an acceptable time. Specific examples of

^{1/} In this example, the timber values represents timber receipts. Of the \$6,627,000 cost, \$2.66 million was expended for road construction.

sites where clearcut systems are least likely to yield desired results without significant adverse impacts and/or mitigation measures like shade-carding, or specific spot planting are the upper elevation true fir-mountain hemlock areas, and droughty southern aspects.



Clearcut regeneration system.

Seed Tree System: A rarely used natural regeneration system, the Seed Tree System relies on seed dropped from a very small number of leave or retention trees per acre (generally 3 to 10 trees) to regenerate the stand. It is authoritatively defined as: "the removal in one cut of the mature timber from an area, save for a small number of seed bearers left singly (reserve) or in small groups (group cutting)."

The practical definition of this system is leaving up to 10 trees per acre on sites where natural regeneration is the goal, and where adjacent residual trees are unable to regenerate the site due to distance, age, or reproductive ability, and are unable to provide adequate numbers of seed uniformly across the area.

The primary area for applying this method is on the east side of the Forest in ponderosa pine type and mixed conifer stands. As a rule, large, dominant specimens which exhibit desired genetic characteristics and have a history of good, consistent seed production are selected for retention. After harvesting and site preparation, the remaining trees are left to produce seed and regenerate the new stand. If the timing of the harvest is synchronized to an average or better seed year, successful regeneration will take place within 2 or 3 years. Once desired levels of regeneration stocking have been achieved, the seed trees can be removed. However, the cost of their removal, the volume to be obtained, or unacceptable seedling losses or damage

may be reasons for leaving the seed trees alone until the first commercial entry into the new stand.

Shelterwood System: This system provides both seed and protection to a new, regenerating stand by the gradual removal, through two or more cuttings in the overstory, of the old stand. The first cutting is generally the seed cutting, and the second one is the final overstory removal. If more than two overstory cuttings are planned, the additional ones are initiated prior to the seed cutting and are called preparatory cuttings. In general, three to five years will elapse between cuttings either to prepare the stand for the seed cut, or to establish the new regeneration. The final overstory cut is not initiated until the new regeneration has been established and is growing. A common variation of the two-step shelterwood system is called a "Two-State Cutting," or "Sequence Logging."

Since a main purpose of this system is to provide shade and protection to the newly regenerating stand, the seed cutting extends over a relatively short period of the rotation. This cutting resembles a heavy commercial thinning, often leaving 10 to 20 trees per acre. On the Forest, it is scheduled around a heavy or high-quality cone or seed crop, with scarification techniques used to provide suitable seed beds for falling seed and improve regeneration levels. This system establishes essentially an even-aged plantation through seed production and site protection provided by the residual overwood prior to final removal.



Shelterwood regeneration system.

Shelterwood System regeneration is suitable on some sites in all species zones on the Forest. But it is most suited and successful on the eastside (Barlow, Bear Springs, and portions of Clackamas, Hood River, and Zigzag Ranger Districts), and on southern aspects where droughty conditions prevail during a significant part of the growing

season. It is also suitable for upper-slope true-fir stands where severe winter conditions such as high winds, frost, solar radiation, and deep snow severely restrict stand establishment and growth.

Selective Cut: This regeneration system is most often used to regenerate and maintain a forest with a wide variety of ages or age-classes (at least four) of generally shade-tolerant species. It is essentially an uneven-aged silvicultural system in which trees are removed individually, here and there, from a large area each year. A modification of this system is called a "Group Selection System," in which trees are removed in small groups.

Selective cutting is much harder to describe and identify in practice. Silviculturally and ecologically, removing a tree or a small group of trees, may cause the regeneration of several tens, hundreds, or thousands of others making that particular location even-aged. As time progresses, the number of new trees declines until they reach the point in which the new "stand" has the same or similar number of trees as the old stand. From a silvicultural viewpoint, the maintenance and management of stands of these small units may be highly desirable and practical. Yet from the viewpoint of efficient management, maintaining and managing such small units is both ineffective and costly. Practically speaking, a selection system would be one in which scattered individuals or groups of individuals are removed from a large group or stand. Furthermore, the large group or stand must:

- (a) Contain at least four distinct age-classes evenly distributed from seedling through the desired rotation age.
- (b) Have each age-class consist of one or more smaller, even-aged "stands," or aggregations with each not exceeding one to two acres in size.
- (c) Each "stand" or group of "stands" or aggregations must be of sufficient size to make management both efficient and economical while achieving realistic management goals.

This method has limited uses. Because it favors natural regeneration and shade-tolerant species, it is largely limited to sites where those characteristics are desired.

Campgrounds, picnic areas, administrative sites, scenic vistas, selected wildlife or fisheries situations, and special-use areas such as summer homes make suitable candidates for the Selective cutting. A more limited use of this system is in sanitation or salvage operations where small areas, limited numbers, or scattered individual trees require removal due to environmental or physical problems. Future application of this group-selection system, or a modification, may be worthwhile in upper elevation, true fir stands of the Pacific Silver Fir Zone. In this zone, seedlings saplings, and even small poles should be protected from the harsh environmental conditions, freeze and snow damage, and encouraged through short growing

seasons, erratic and slow regeneration, and shallow and poor soils.

(4) *Vegetation Control.* For the past decade, the Forest has reforested by planting and natural regeneration an average of about 5,000 acres per year. Steep slopes prevent machine planting on most sites, making hand planting the normally prescribed method. Units are now planted or naturally seeded within five years of harvest, and the backlog of unforested sites from previous harvests has been eliminated.

When competing vegetation is removed, the growth and volume of timber yields improve. Each year, the Forest treats about 4,500 acres by thinning or release. Release is the removal of competing vegetation, comparable to weeding a garden. About 90% of treated acres are thinned. When tree stands are thinned by cutting trees before they are large enough for industrial uses, it is called precommercial thinning. This is usually done when stands are about 15 years old, and it increases the future usable volume in plantations. The number of treated acres has remained fairly constant over the last decade.

Release describes various methods of removing vegetation on a case-by-case basis. The Forest does not presently use herbicides to control vegetation that adversely affects tree growth. However, other methods are available. Depending on the species of brush to be removed, mechanical release using a chainsaw is one method. On the east side, this method may be preferable to underburn (the use of fire). Experience shows that the most important and best control of competing vegetation is an aggressive reforestation program. This program can give the young trees a head start on the growth of the brush.

Release treatments are planned for 10% of the reforested acres on the Forest. This may include a full range of alternative treatment methods including manual, mechanical, prescribed fire, biological, and chemical (herbicide) methods. The purpose is to keep conifer plantations growing with less competition. All of these methods reduce the total amount of vegetation competing with trees; consequently they also reduce the amount of habitat for small species of wildlife, and the amount of graze and browse for larger animals.

(5) *Fertilization.* The need for intensive management, coupled with recently developed data on the soil's response, indicate that a program for fertilizing the Forest's Douglas-fir sites would be beneficial from a silvicultural standpoint. Fertilization has recently been employed on the Forest. However, FORPLAN results indicate that Fertilization is not needed to economically meet harvest objectives.



Tractor skidding.

(6) *Use of Chemicals in the Management of Forest Vegetation.* In June 1981, The Pacific Northwest Region of the USDA Forest Service issued a programmatic Final Environmental Impact Statement (FEIS) of Methods of Managing Competing Vegetation. This statement included detailed discussions and analysis of the consequences of implementing full use of all methods of control as well as other alternatives ranging from no vegetative management to no application of herbicides.

Currently a new Environmental Impact Statement is being prepared by the Pacific Northwest Region of the USDA Forest Service for a proposed Vegetative Management Program for the entire states of Oregon and Washington.

The Environmental Impact Statement is being prepared as a result of a lawsuit filed against the USDA Forest Service by the Northwest Coalition for Alternatives to the use of Pesticides, The Oregon Environmental Council, and the Audubon Society. Oregon District Court Judge Burns issued an injunction after hearing the case. The injunction banned the use of herbicides in the Pacific Northwest by either the Forest Service or the Bureau of Land Management until a "Worst Case Analysis" was completed and properly considered by decision makers. The Forest Service and BLM completed a human health risk assessment on the use of herbicides. This assessment included a "Worst Case Analysis." Both agencies are now incorporating this risk assessment into their programs for managing competing and unwanted vegetation.

(7) *Animal Control.* The Forest has initiated measures to reduce or eliminate animal damage to young trees on about 1,600 acres each year. Damage-control measures include placing plastic tubes over young trees and applying repellents or rodent poison.

(8) *Pest Control.* The worst pest problem on the Forest at this time is an outbreak of western spruce budworm on the east side. The infestation will probably be near-epidemic in proportion for the next few years. Environmental and economic analyses indicated that it may be cost-effective to treat the outbreak in specific places.

For insect control in general, the Forest relies on an integrated pest-management program. The main thrust of this program is to maintain healthy stands of trees through proven silvicultural and harvest techniques. Insect infestations tend to follow stress placed upon trees by other agents, so that the domino effect of pests can be reduced by keeping stands growing to the maximum.

(9) *Integrated Pest Management: Diseases.* The most prevalent and damaging diseases on the Forest include:

Laminated root rot. Caused by the fungus, *Phellinus weirii*, this disease occurs on both sides of the Forest, mainly in Douglas fir, Pacific silver, white, and grand firs. The disease is a serious problem because the fungus can survive for decades in old stumps or roots. Treatment is to remove infected or susceptible host trees.

Annosus root and butt rot. Caused by the fungus, *Fomes annosus*, this disease is found in all conifer species. The rot spreads by windborne spores to freshly cut stumps and wounds on trees. Short rotations tend to minimize decay loss. Careful logging practices aimed at minimizing injury to residual trees also help.

Armillaria root rot. Caused by the fungus, *Armillaria mellea*, this disease strikes most tree species. The best method of control is to maintain vigorous growing stock.

Dwarf mistletoes. The most prevalent mistletoe on the Forest is the mistletoe found in hemlock, *Arceuthobium tsugense*. Mistletoe spreads most rapidly in multi-storied stands. Infested overstories are generally removed if manageable and susceptible understories are present.

White pine blister rust. Caused by the fungus, *Cronartium ribicola*, this is the most serious pest of western white pine on the Forest. This species is needed in regeneration efforts on certain sites where white pine is needed for the reforestation program. The Forest has an on-going program of finding and "proving" the resistance of selected white pines to the disease.

(10) *Availability of Logging Systems.* One of five systems used on the Forest, horse logging, is usually limited to stands like campgrounds, summer home sites, and other

special areas requiring protection, such as the Bull Run Watershed. Existing roads are usually used, and the logging distances are short. Soil compaction is low; area damage is slight. Although this method is one of the least disruptive to the land, its limitations include short skid distances, limited log sizes, heavy slash or brush, adverse topography, snow, ice, or rocky ground, special care of the horses, and limited production.

The second system uses tractors, rubber-tired skidders, and possibly low-ground-pressure downhill skidders. Logging with tractor and rubber-tired skidders can cause serious soil compaction. Skidding is usually limited to slopes under 30 percent. Yarding in this method usually requires a skid road and road system more dense than used in cable yarding, and it requires more landings per acre. This method can be used equally well with even or Selective Cut management prescriptions.

The High Lead method is basically a ground skid system in that the front-end weight of the logs is not lifted until they are about three times the height of the spar from the landing. Maximum yard distance is about 1,000 feet uphill, and 600 feet downhill. Lateral yarding is limited by the length of the chokers. This system usually applies only to clearcuts. The transportation system is critical to an efficient operation, and road density is moderate.

A method called Skyline is sometimes used on the Forest. This system requires the front of the log to fly clear of the ground, and often the entire log is in the air. An advantage is its comparative low impact on the environment. It can be set to reach long distances up or downhill, and consequently road densities are often low. When logs fly free of the ground, the method becomes quite fast and economical. It is used for even-aged and selective cut prescriptions with some skyline equipment having substantial lateral pulling capabilities. Costs are intermediate and production is usually high.

The fifth method, Helicopter Logging, has been used on the Forest since 1970 where operations require special considerations. Sensitive areas that cannot tolerate conventional systems, or inaccessible areas, are most often prime candidates for this logging method. Either even-aged or uneven-aged prescriptions are possible. Helicopter logging is limited in the minimum volume per acre, maximum haul distance and/or vertical elevation changes. The greatest limitations are established by costs. As a result, this method of logging is not often the one selected on the Forest after cost considerations enter into the logging system analysis.

4. Minerals and Energy Resources

a. Background: Laws and Regulations

Different laws and regulations govern the exploration and development of all minerals owned by the United States. The types of minerals which may be available include those which are:

- (1) Locatable.
- (2) Leasable.
- (3) Salable (i.e. common variety minerals).

Locatable minerals include all of those deposits on public domain lands subject to disposal under the General Mining Law of 1872, as amended, and not excepted from this category by subsequent mining laws. Locatable minerals include any solid, natural, inorganic substance in the crust of the earth excluding common varieties of minerals and leasable minerals.

The Mining Act of 1872 granted to the public the right to explore, stake, develop, and patent a mining claim on land in the public domain. When a mining claim is patented, the patent conveys mineral and surface rights to the claimant. The Bureau of Land Management must issue a patent if the patent applicant satisfies the statutory requirements.

The Mt. Hood Mining Act of May 11, 1934 (48 Stat. 773) amended the 1872 Mining Act as it impacts patent rights on the Forest. Under this amendment, all patents issued under mining laws which affect lands on the Forest convey only the mineral title, not the surface title. The purpose of this law is to retain the Forest's valuable surface resources under Federal ownership, and allow them to be administered by the Department of Agriculture, Forest Service.

Leasable minerals include those excluded from the 1872 Mining Law through the Mineral Leasing Act of 1920, or the Mineral Leasing Act for Acquired Lands (August 7, 1947). Leasable minerals include coal, oil, natural gas, phosphate, sodium, potassium, oil shale, sulfur (in Louisiana and New Mexico), and geothermal steam.

The Mineral Leasing Act of 1920, as amended, authorizes the Secretary of Interior to issue leases and permits on National Forest lands. The Forest Service now reviews mineral lease applications and permits and makes recommendations to protect surface resources and prevent conflicts with other users and resource programs. The Geothermal Steam Act of 1970 (30 U.S.C. 1001-1025) requires that leasing of geothermal resources on National Forest System Lands be subject to the consent of, and subject to conditions prescribed by, the Secretary of Agriculture.

Salable (or common variety) minerals include those which are nonmetallic with widespread occurrence. Examples are common varieties of sand, gravel, pumice, clay, pumicite, petrified wood, and various types of building stone.

Surface protection recommendations provided by Federal Regulations 36 CFR, 228 subpart C, establish the policy and standards for disposal of saleable (common variety) minerals. The Materials Act of 1947 (30 U.S.C. 601 et. seq.) generally requires competitive bidding for purchase and use of salable (common variety) materials on public domain lands, but a Free Use Permit may be issued to a nonprofit organization or another government agency for this type of material.

At this time 275,371 acres of the Forest have been withdrawn from coverage by the 1872 Mining Law for locatable mineral entry. Of this total, 181,600 acres have also been withdrawn from mineral entry according to the Mineral Leasing Act of 1920, and the Mineral Leasing Act for Acquired Lands (August 7, 1947). A total of 783,979 acres remain available for mineral entry. However, not all of the available acres have any potential for mineral development nor are all acres with mineral potential available. The conflict between potentials and availability is taken up in more detail in individual mineral descriptions. Energy resources on the Forest include geothermal resources, oil and gas, which are leasable; and hydroelectric sites, which are requested by the Federal Energy Regulatory Commission. Hydroelectric development is described at the end of this section.

b. Existing Situation

(1) *Locatable Minerals.* Exploration and development of these minerals has been limited on the Forest. The U.S. Geological Survey has identified the following three "Mining Districts" on or near the Forest's boundaries:

- The Oak Grove Fork District
- The Zigzag (Laurel Hill) District
- The North Santiam District

One thousand acres on the Oak Grove Fork Mining District are moderate in mineral potential (see glossary for definition of mineral potential). All other areas on the Forest are low in mineral potential, although prospects for various other metallic ores in addition to mercury are scattered throughout the Forest. The main ones are gold, silver, and copper. Exploration and staking of claims for locatable minerals, particularly for mercury in the Oak Grove Fork District, are expected to continue to some degree. Development of mineral claims is not anticipated except on the Oak Grove Fork of the Clackamas River. Mining operations of locatable minerals should be small and intermittent.

(2) Leasable Minerals

Geothermal Resources: In 1975, the U.S. Geological Survey identified three "Known Geothermal Resource Areas" (KGRA's) on the Forest. The geology of these areas, and competitive interest in nearby discoveries, indicate that the potentials for extracting geothermal steam may justify investing money for energy purposes. KGRA's on the Forest occupy 17,920 acres:

Table III-30

Known Geothermal Resource Areas (KGRA's) on Forest

KGRA	LOCATION	ACRES
Mt. Hood	Summit of Mt. Hood	8,960
Cary (Austin)	Adjacent to	7,680
Hot Springs	Clackamas River	
Breitenbush	Southern portion of Clackamas District	1,280
TOTAL KGRA ACRES		17,920

A total of 127 noncompetitive geothermal lease applications, covering a total of 292,177 acres outside of KGRA's, had been filed on Forest lands through 1985. In April, 1984, the Bureau of Land Management opened the Cary (Austin) Hot Springs and the Breitenbush KGRA to competitive bidding. No bids have been recorded to date.

The Oregon Department of Geology and Minerals, the U.S. Geological Survey, the U.S. Department of Energy, private firms, and a number of private individuals have conducted geothermal exploration since at least 1976. Most geothermal explorations to date have been on the northern part of the Forest. Investigations through 1980 culminated in a geothermal assessment of the Forest published by the U.S. Geological Survey. Recently, interest has increased in the southern part of the Forest, with efforts concentrating mainly in the Clackamas Ranger District. At this time, none of the companies or individuals carrying out geothermal explorations have reported any indications that they have located significant geothermal resources on the Forest.

A total of 17,900 acres within KGRAs have been classified as high in their mineral potential. Areas classified as moderate in mineral potential total another 261,800 acres. Areas totalling 821,000 acres are rated low in potential. Approximately 8,960 acres in the Mt. Hood Wilderness have been classified as high in geothermal potential, but they are not available to leasing or exploration. This area was withdrawn from minerals by the Oregon Wilderness Act, 1985.

Oil and Gas Resources: There are presently 54,866 acres now under oil and gas leases on the Forest. Applications for other leases have been filed, and then withdrawn. State and private groups continue to review the geology of both sides of the Cascade Range for oil and gas potential. Areas totalling 340,200 acres which have had oil and gas lease applications, or leases, have been classified as moderate in potential. The remaining 760,500 acres of the Forest have been classified as low in potential. To date, no prospecting permits for exploratory drilling for oil and gas have been issued.

The 54,866 acres now under oil and gas leases must be drilled within 10 years or the leases will expire. Until exploration near the Forest proves the area has worthwhile oil and gas potentials, areas now under lease and lease application are unlikely to be drilled and the leases will be discontinued.

(3) Salable or common Variety Mineral/Rock Resources: The common variety mineral with the greatest Forest production is rock. The basic need for rock is in the construction and maintenance of the Forest's roads. Rock is a limited, non-renewable resource, and material suitable for road construction is in short supply in certain parts of the Forest even though it is available in 162 quarries. Of this total, 147 quarries are developed and 15 undeveloped. An undetermined potential for rock exists in 170 additional sites. Still another 182 quarries have been closed due to economics, management direction, or depletion of rock.

In 1979, the Forest published a Rock Resource Plan to provide the authority to use rock and to guide the planning and development of this resource. It initiated a study to evaluate the situation of the time and the demand for rock over the following two years. The study found that many areas of the Forest are short of the rock needed to fully manage the Forest's other resources, also, that the shortage would soon affect different areas. Based on known quantities of rock from existing quarries, assumptions about the location of new quarries, and that standards of road building would not materially change, the study predicted that the Forest will be able to meet 38% to 86% of the rock demand. The use of rock procured off the Forest, which is low at this time, was not factored into the 1979 predictions.

The demand for rock by Forest users peaked in the late seventies and has declined in the past four to five years. The demand for non-Forest use is sporadic. The average demand over the next decade is expected to equal the average use over the previous ten years.

The most important concern pertaining to rock is its uneven distribution on the Forest. Because it is not always available where needed, transportation costs increase, labor costs increase, and projects are delayed. Another concern for the long term is that rock is a non-renewable resource,

and as the Forest's inventory is depleted other sources will have to be located.

Utilization of the Forest's rock resources has localized impact, although the impact on the natural environment may be severe where the quarry is located. Developing rock quarries close to streams can reduce water quality which negatively affects fish habitats. Sensitive plants and cultural resources can also be unfavorably affected by nearby rock quarries, so these may be limited or prohibited where sensitive plants or cultural resource sites are located.

The operation of a quarry generally means the elimination of other uses of the site. Quarries can negatively impact the scenic vista, and the impact of rock removal on the landscape lasts a very long time. Therefore, the maintenance of scenic quality may require the curtailment or modification of quarry development in some of the more critical areas. Areas near a quarry may be rehabilitated for different uses after the rock resource has been used up.

(4) Small Hydroelectric Development. The first hydroelectric project on the Forest was the Three Lynx project on the Oak Grove Fork and Clackamas River completed in 1923. In March, 1979, the city of Portland received a license for a powerplant in connection with their Bull Run waterworks. These two plants plus a third have a total rated capacity of 86.6 megawatts (MWs). Another site with a rated capacity of 0.012 MWs is under construction. Four other sites with a rated capacity of 39.2 MWs are being considered for development.

There are 31 proposed hydroelectric sites on the Forest, rated at 142.6 MWs. Thirteen additional proposed sites are not located on the Forest, but on streams flowing from Forest lands. Plants on these sites would be subjects of concern because they could affect fish, and fish habitats, in stream reaches located on the Forest. As the map shows, most of the proposed sites are in the Clackamas and Hood River drainages.

The Federal Energy Regulatory Commission (FERC) issues licenses to applicants seeking to develop small hydroelectric sites. If FERC determines the development will not cause environmental damage, it issues an exemption from full license procedures. Under exemptions, the Forest, along with the Oregon Department of Fish and Wildlife, can require conditions for the development of the site. Licenses are granted by FERC for sites requiring particular stipulations. The Forest can propose stipulations to FERC which must be included in the license requirements. Since 1984, FERC activity on the Forest has mainly been involved with five or six sites where permittees are seriously trying to develop hydroelectric power.

From about 1980 through 1983, developers of small hydroelectric facilities increasingly sought out sites for power development, and put in claims for them. This period was marked by a sense of urgency for improving

the nation's energy position, and other circumstances were at work to create an unusual demand for more hydroelectric development. The driving force of this increased interest appears to have been the Public Utility Regulatory Policy Act (PURPA) enacted November, 1978. After 1983, the rush to claim new hydroelectric sites declined. The Pacific Northwest now has an energy surplus, and the Northwest Power Planning Council estimates the surplus will continue in the region through the early 1990's. Small hydroelectric facilities, according to the Council, will contribute slightly toward the region's total energy needs of the future.

5. Transportation System

a. Background

Forest roads and highways play a vital role in providing access for people using the Forest, and in moving the Forest's products. Roads are also essential to the administration and protection of the Forest.

The rugged Cascade Mountains, a natural barrier to east-west travel, strongly influenced the development of transportation in the Forest's history. As people moved into the region, their natural travel routes, like the river, lands in the Columbia Gorge, and other rivers and ridgelines were used increasingly for the movement of goods and services.

From the beginning of modern times, the Columbia Gorge has been the primary Northwest travel route for east-west movement. The Columbia River was the main carrier until the 1880's when trails and rail lines augmented river travel. Construction of major roads began about 1915; freeway reconstruction followed in the 1950's; and transmission lines and air routes completed the area's present system.

A second major travel corridor, the Barlow Wagon Road and Trail, was established south of Mt. Hood. In 1845, the Barlow party followed Indian trails through the mountains, and those trails became an alternate route to the Willamette Valley. Although the route was improved, it remained rigorous to travel, and weary pioneers had to muster their last ounces of strength to complete it as the last leg of their journey west. The Barlow Road was a private toll road until 1915 when it was deeded to Oregon state. Four years later, in 1919, part of the route was improved for automobile uses. In 1924, the scenic highway loop around Mt. Hood was finished. The Mt. Hood Highway, now U.S. Route 26, is the most direct route from Portland to Mt. Hood and central Oregon.

Except for the Gorge and Mt. Hood highway routes, the transportation system on the Forest remained relatively primitive prior to the end of World War II. A road to Cloud Cap Inn was built in the 1880's for recreational pur-

poses, another one to Lost Lake was completed early in this century. The Larch Mountain Highway, built as a scenic drive, was completed in 1939.

The main emphasis prior to World War II was an extensive system of trails built by the Forest Service for fire suppression and administration.

Trails called "truck trails" were also constructed, many of them by the Civilian Conservation Corps. These trails established the primary network for the Forest's road system as it exists today; in fact, major trails often were so well planned that later they were developed into modern roads.

As the area's timber on lower elevations of private lands was used up, rail lines and logging roads were needed to reach the Forest's timber on the east side where topography and vegetation made access comparatively easy. Some of the earliest logging roads and mills were established on the eastern boundary of the Forest in the 1890's. Between 1918 and 1935, logging railroads had penetrated to private and Forest lands in the West Fork of Hood River, and to the Badger/Jordan area. Larch Mountain and Ladee Flat, on the west side, were also logged by rail.

By the 1930's, the Clackamas drainage and Bull Run Reserve were the only large sections of the Forest lacking roads. Opening of the Clackamas began in 1923 when rail lines were constructed to the Oak Grove power plant. A truck trail soon followed. World War II started an intensive effort to harvest the valuable timber supplies in the Clackamas. When that war ended, road building financed by congressional appropriations and the sale of timber took place throughout the Forest except in the Bull Run. The focus of this period of development was the Clackamas drainage where timber had the most value.

A breakthrough in harvesting the Forest's timber occurred in the 1960's when the Clackamas River road system was connected to the Breitenbush system on the Willamette National Forest. Linking the systems eliminated some timberhauling problems because it permitted hauling in two directions. The two systems also assisted in reaching larger amounts of timber. Other recent road construction includes the Lolo Pass Road, built as part of a powerline corridor project, opened to the public in 1952, and Bull Run roads initiated in 1959.

b. Existing Situation

Three types of roads make up the Forest's transportation system of approximately 3,651 miles of roads.

Type 1: 365 miles of road are classified as arterials. These main routes provide service to large areas and usually connect with public highways or other arterial roads on the Forest to make up a network of primary travel routes. They are usually built and maintained for long-term management of land and resources with uninterrupted service. Their locations and standards of construction are

therefore determined most often by the need for maximum mobility and travel efficiency, not the needs of specific Forest resources.

Type 2: Collector roads total 1,184 miles and were built to serve smaller land areas. Usually connected to a Forest arterial or a public highway, they collect vehicles from local roads or terminals. They are built and maintained for either uninterrupted or intermittent service depending on land-use and resource-management objectives of the area(s) served. Their locations and standards of construction are therefore determined by long-term, multi-resource service requirements, not just travel efficiency.

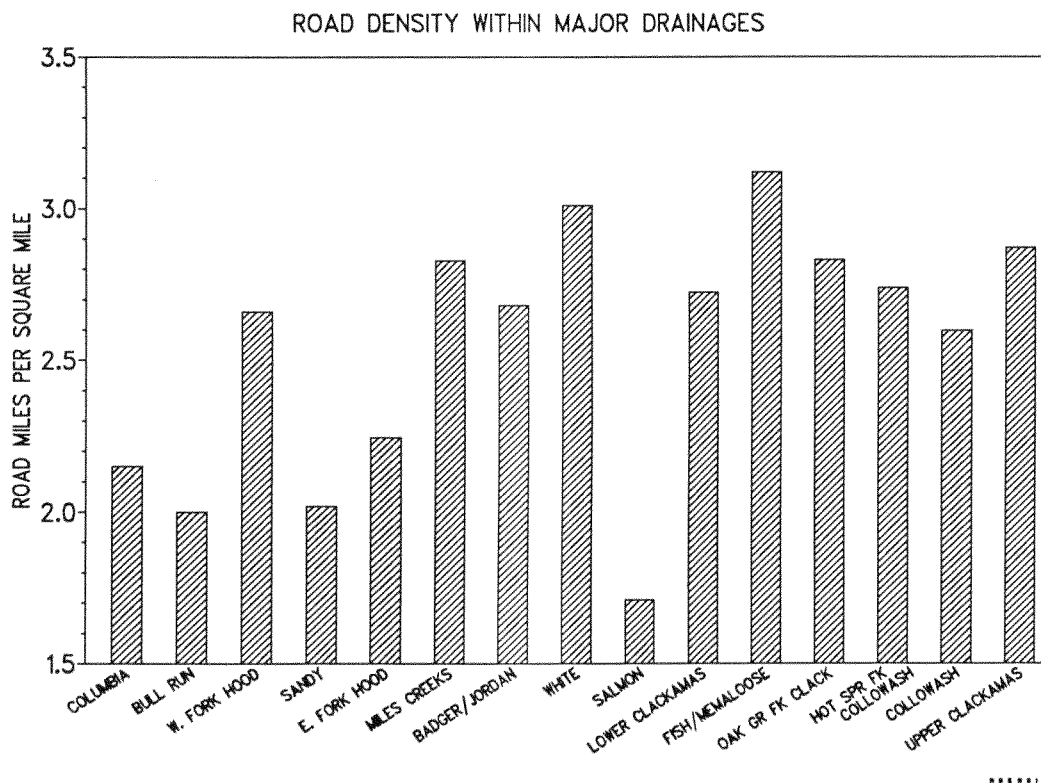
Type 3: Local roads extend 2,126 miles and connect terminals with the Forest's collector or arterial roads, or public highways. These roads may be developed and maintained for either long-term or short-term service. Their locations and standards of construction are determined by the need to serve a specific resource, or activity, not travel efficiency.

Paved roads extend over 761 miles, including approximately 159 miles of paved roads in the Bull Run Management Unit. All 294 miles of road in this management unit have use restrictions. The roads within the Bull Run drainage are all closed to public use. Other roads on the Forest may be closed either temporarily or permanently for safety reasons or to protect resources.

Arterial and collector roads are essentially completed, although many sections of the roadway are inadequate for existing traffic and require reconstruction. The major area of new construction will be in the local road system.

Road density compares the amount of roads in an area to the square miles they serve. The accompanying chart shows the existing road density for the developed portion (that is, outside of inventoried unroaded areas) of each major Forest drainage.

Figure III-9



Road standards for the three types of roads on the Forest vary from double-lane paved roads to primitive dirt roads with one lane. The total includes 1,318 miles suitable for passenger cars, 1,612 miles are limited to high-clearance vehicles, and another 515 miles are closed to all non-authorized traffic. Single-lane, gravel-surfaced roads with vehicle turnouts for safety make up the largest part of the system.

Major public highways associated with the Forest are:

- Interstate 84.
- State Highway 26.
- State Highway 35.
- State Highways 224 and 216.

A total of 1.7 million vehicles use the Forest's transportation system to some extent every year. Most of these vehicles (about 1,300,000) are driven by visitors. Administration and protection activities by Forest Service employees account for 250,000 vehicle entries. Another 75,000 vehicle entries are associated with hauling 135,000 truckloads of logs per year.

Demands on the Forest and associated roads are projected to increase in response to a number of developments. Nearby population increases will increase the demand for fuelwood and recreation opportunities, resulting in greater traffic and heavier demands on public transportation systems.

Anticipated increases in traffic volume will require the design and construction of roads to insure adequate safety and environmental protection. Increases in road usage may require higher standards for transportation facilities than have been provided in past years. An alternative would be more road closures than in the past. Higher standards and road closures may produce higher costs and greater needs for resource specialists' interactions. Interdisciplinary planning and public inputs may also need to be increased.

The existing situation and potential growth impacts on Highway 26 were studied by the Oregon Department of Transportation, the Forest Service, and the Federal Highway Administration. The study found that the capacity of Highway 26 east of Rhododendron is being exceeded for periods of time every year. The Oregon Department of Transportation has evaluated several alternatives for increasing the capacity of Highway 26 between Brightwood and Rhododendron in a recently completed Environmental Impact Statement.

According to an analysis of existing bridges, approximately 21 need replacement, 18 need repair, and 2 must be abandoned or removed. This work is to be completed within the next 10 to 15 years. The 41 bridges inventoried include:

- Steel or concrete bridges more than 35 years old.
- Log bridges more than 15 years old.
- Treated timber bridges more than 25 years old.
- Bridges with load-bearing capacity significantly less than allowed under current laws or regulations.
- Bridges with significant damage, corrosion, or decay as found by inspections.

c. Relationship to the Natural Environment

(1) *Wilderness.* The interaction between road construction and Wilderness is essentially limited to the land area along the fringe of the Wilderness. Road construction can improve access to Wilderness which is an important issue to many Wilderness users. To other Wilderness users,

however, roads along the fringe of the Wilderness create noise, lights, and landscape modifications which may impair their Wilderness experience.

(2) *Visual Resources.* Road systems built for timber management affect most, if not all visual conditions. Travel routes, including trails, offer opportunities to view and experience Forest scenes, but highly visible roads may be distractions due to factors like steep slopes, contrasting soil colors, and little vegetative screening. Midslope locations are the most disrupting, but roads built along ridgetops and valley bottoms tend to retain scenic quality. Other ways to reduce the visual impact of roads are adding vegetative screening or reducing their width.

Foreground roads usually cost more due to revegetation of slopes and backfilling the road profile to reduce the visual contrast of the cut and fill slopes. Skillful location of future roads to trailheads, scenic points, ridgetops, and other locales can provide attractive vistas and expose scenic attractions; that is, the roads can enhance rather than detract.

(3) *Timber.* The area required for roadways and slopes ranges from 3 to 9 acres per mile of road. Currently, Forest roads occupy about 20,400 acres which reduce the area available for timber production accordingly. The need for roads must be considered in virtually all phases of silviculture including fire, pest, and disease control. Existing roads have generally been built in areas of large timber volumes where the values of timber harvest were high. Some forested areas have not been roaded because the stands are young or thinly stocked, values were low, or other resource values were considered more important.

(4) *Wildlife.* The major impact of the Forest's roads on wildlife no longer comes from road building, but from the uses made of existing roads. The number of people interested in wildlife, both observing and hunting, has increased. Seasonal road closures in some areas have become necessary to reduce the number of hunters in such areas and improve the quality of the hunting experience. Seasonal closures have also been necessary to avoid harassing animals during nesting, fawning, calving, and winter feeding periods. Elk spend less time in habitats near roads continually open to vehicles, according to a 1977 University of Idaho report. Roads with heavy traffic and cross-migration, or near main travel routes for big game, increase the likelihood of collisions. The Forest works closely with Oregon's Department of Fish and Wildlife to control the distribution of hunters, big game included, on the Forest.

Some species of wildlife, such as some birds, mammals, and reptiles, have benefitted from road construction. These animals inhabit the type of edge created by the construction and the re-vegetation of cuts and fills.

(5) *Minerals and energy.* Road building and maintenance deplete common variety mineral resources, while at the

same time providing access for mineral exploration, development, and production activities. Extended interest in geothermal energy could add strains to the existing road system due to increased exploration and production, but this burden does not appear a special problem at this time. Rock, however, is a non-renewable resource in unevenly distributed locations which may lead to future environmental problems. This situation is discussed in the section on mineral resources.

(6) *Water.* The average road density of 2.12 miles per square mile of Forest lands raises the serious question of road values versus water-quality values. There is no doubt that the water resource risks degradation due to roads, especially during the first and second years after construction. The risk comes primarily from increased sedimentation of streams due to erosion of the road prism before it stabilizes and/or becomes re-vegetated.

Sediment is not the only threat to water quality created by roads. Four additional concerns include:

(a) An increase in the watershed drainage network and its flow efficiency can cause higher water velocity in natural channels, and possibly greater peak discharge.

(b) An increase in the surface area impervious to runoff increases water yields from those surfaces, and also disposes of it faster.

(c) Intercept of shallow, subsurface flows. Road cuts on steep slopes commonly intercept shallow, subsurface, and sometimes perennial flow zones. This immediately adds flow to surface drainage networks.

(d) An encroachment on stream channels and flood plains. By creating more efficient drainage networks and increasing stream power, roads tend to increase the risk of reduced water quality through accelerated bank and channel erosion, and the movement of erosion products including debris.

(7) *Soils.* Although road building and maintenance are needed in developing and managing the Forest's lands, the activity can also have major impacts on the soil resource. Construction displaces large amounts of soil, exposes large areas of subsoil materials, and normally accelerates soil erosion. Some road maintenance work like surface blading and ditch and culvert cleaning can increase the rate of erosion for short periods. In addition, roads can forever remove once-productive land.

(8) *Fisheries.* The building and maintenance of roads have various direct and indirect impacts on riparian-dependent resources including fish.^{1/} Direct effects result from

^{1/} Reference: General Technical Reports PNW-109 and PNW-110, "Planning Forest Roads to Protect Salmon Habitat," and "An Annotated Bibliography Of The Effects Of Logging On Fish Of The Western U.S. and Canada," respectively, USDA Forest Service.

removing or modifying ground cover and/or riparian vegetation, physical modification of stream banks and/or stream channels, and modification of floodplain flood storage and routing characteristics. Where roads parallel streams for extended lengths, substantial areas of the riparian resource may be lost or negatively modified.

Road fills can modify flood storage and routing characteristics of floodplains, and can modify the character of stream-banks and/or channels. When channels are straightened or narrowed, fish habitat areas are lost. The loss of stream-bank cover, in-channel structure, and quiet-water habitats, often found on stream channel margins, or in small side and overflow channels, reduces fish-habitat quality.

Upstream fish passages can be blocked by road crossings of streams. A recent Forest Inventory of Road Crossings (1984) found at least 60 miles of anadromous habitat blocked, mainly by culverts. Since salmon and steelhead make extensive migrations to spawn, such restrictions can be deadly. In addition to crossings, excessive water velocity, limited water depth, and/or excessive jump heights into the culverts create passage problems.

Indirect impacts of roads are numerous. They provide easy access to riparian areas for recreation or other uses. At the same time they also provide access for heavy equipment and materials needed for riparian area rehabilitation or enhancement. More than 70% of the Forest's developed recreation sites are within riparian areas. The location of these sites can lead to disturbances, harassment of fish, and poaching of anadromous fish. Harassment of spawning Spring Chinook and Coho salmon has been seen on Fish Creek, Still Creek, Salmon River, Clackamas River, and other habitats.

Unplanned dispersed recreation site development can occur due to vehicles driving into abandoned logging spurs or inadequately closed temporary roads. This sort of development often destroys riparian vegetation, accelerates sedimentation, and can even eliminate snags and large woody debris in the streams. This type of debris is desirable in flowing water because it provides a diversity of micro-habitats for fish and aquatic organisms. Recent studies of Fish Creek (Everest et. al., 1984), a stream followed by an all-season road much of its length, found large woody debris to be about 20% of the amount expected for a similar stream flowing through a natural, old-growth forest. The study commented that significant reductions in favorable salmonid-rearing habitats probably took place in the stream. On the other hand, roads make the planting of hatchery-reared fish easier in streams, lakes, and reservoirs - an essential activity to support the heavy recreational angling in the Forest's rivers, lakes, streams, and reservoirs.

Other indirect effects of roads include a variety of impacts. Gibbons and Salo (1973) found that Forest roads are the

main source of man-caused accelerated erosion, well-known as a primary source of undesirable sedimentation and increased turbidity. These conditions degrade the quality of both spawning and rearing habitat for resident and anadromous fish. Excavation and sidecasting are major contributors to the exposure of mineral soils, the collection and routing of runoff, and reductions in slope stability. Road clearings which result in the loss of vegetative cover on streambanks can cause increased water temperatures, the reduction in bank stability, and lost hiding cover for fish. The use of Forest roads to transport chemicals add the risk of spilled chemicals, fuels, or toxic materials with relatively large though localized effects on water quality and aquatic life. Chemicals used on Forest roads for dust abatement, road surfacing, or vegetation control can leach into water and reduce its quality.

d. Relationship to the Human Environment

(1) *Recreation.* Approximately 90% of total Forest recreation uses are closely tied to roads, according to 1983 Recreation Information Management estimates, Report No. 2300-1. Roads provide access to both existing and potentially developed recreation sites. Accessibility helps to determine the types of visitors, their types of transportation, and what kinds of recreation they experience. Road access makes feasible such activities as camping, fishing, hunting, gathering firewood, picnicking, touring for pleasure or viewing the scenery, winter sports, hiking, water sports, the use of Forest resort facilities, berry picking, cutting Christmas trees, gathering mushrooms, observing wildlife, and more. Road usage can be managed to attract or limit specialized vehicles such as high-clearance types, campers, or ORVs. The accommodation of recreational activities is a basic element of road design, construction, and maintenance. For example, road building into unroaded areas can expand dispersed roaded-recreation opportunities while it also reduces the activities of those who seek unroaded recreation.

(2) *Cultural Resources.* Many routes used by the Forest's road system trace back to prehistoric travelways, prospectors' trails, sheep driveways, military roads, and wagon trails. The result is a considerable interaction between road development and cultural resources. Galm et al., found (1981) that the location of a road, the characteristics of soils, and the volume of its use determines the intensity of such interactions. Since roads increase motorized access to archaeological sites formerly reached only by foot or pack animal, that access may have helped to increase vandalism. However, data concerning the sites prior to road building are not available, so the possibilities of vandalism cannot be verified. The matter should be monitored in the future.

The main benefit of roads with regard to cultural resources is the access they provide to more remote areas. Improved

access permits improved cultural-resource inventories which will also benefit the public by providing access to sites selected for interpretation.

Although considerations for cultural resources have caused some slight shifts in road locations, and modifications of design where conflicts have been identified in advance of construction, these have not added significantly to the costs of the road program.

Miscellaneous impacts of roads on the human community include firewood collecting and range allocations. The Forest's road network is heavily used by people to remove firewood, poles, fence posts, and various other products. While range allocations are a minor use of the Forest's resources, permittees use roads to move livestock to and from various range locations and in managing their grazing operation. Forest personnel use roads to monitor forage and various other range-related activities.

e. Management Concerns

Forest roads are constructed, operated, and maintained for the administration and protection of its lands. Section 8 of the National Forest Management Act states: "Roads constructed on National Forest System Lands shall be designed to standards appropriate to their intended uses, considering safety, cost of transportation, and impacts on land and resources." This law implies that no one factor of those cited should outweigh any other. Therefore, a balance must be found for each section of road in determining the design standards. The use, protection, and management of the Forest's resource objectives make up the criteria for road planning and maintenance.

It is sometimes necessary to close roads on the Forest, most often to meet land-management objectives. Such closures are authorized in CFR, Title 36, part 261. Specific reasons for closure include:

- Protecting wildlife habitats, maintaining water quality, controlling erosion, public safety, conflicting uses, reduction of maintenance costs, and legal mandates.

Timber management activities served by the road network include planting; thinning; fertilizing; seed collecting; treating harvest residues; controlling pests, fires, and diseases; plus various other operations needed in the conduct of intensive timber-management programs. Since roads are needed to move logs from harvest areas to mills, a special management concern is the impact of log trucks, lowboys, yarders, loaders, service vehicles, etc., on the Forest's road-building standards and road conditions. Major factors in such considerations are that receipts from timber sales pay for virtually all new road construction on the Forest, and that the location of areas to be harvested, the slope of the ground, and the logging system used determines the needed road density.

Although timber management is a significant element in road planning, another element is the use of roads to accommodate recreational uses. Road maintenance levels may be revised or upgraded, timber or rock hauls may be re-routed or especially timed, or roads reconstructed to insure the safety of mixed traffic users. Many roads, including Highway 26 to Mt. Hood and Highway 224 up the Clackamas, were originally built to provide access to recreation. In other instances, roads may be closed to protect or enhance recreation opportunities like hunting, back-country hiking, or camping.

6. Recreation

a. Background

Within a short drive from the urban areas of Portland, the Mt. Hood National Forest offers a wide range of outdoor recreational experiences, activities, and recreation facilities including:

- More than 100 developed campgrounds, picnic sites, and other facilities, including Cloud Cap Inn, Multnomah Falls Lodge and Barlow Road.
- Six Wildernesses totalling approximately 186,000 acres. These include a portion of the Mt. Jefferson Wilderness and four established by the Oregon Wilderness Act of 1984.
- An extensive trail system concentrated in designated Scenic Areas and Wilderness that totals approximately 1,202 miles and includes 111 miles of the Pacific Crest National Scenic Trail.
- Winter sports opportunities including downhill and cross-country skiing, snowmobiling and snowplay on 165 miles of designated snow trails and at five ski resort areas, including Timberline Lodge.
- Pleasure driving, enhanced by scenic views and spectacular waterfalls, on more than 300 miles of paved Forest roads, including 3 scenic major highway loop drives and over 3,000 miles of other forest roads, including Columbia River Scenic Highway.
- Opportunities for hunting and fishing, including fishing for salmon and steelhead trout and native fish.
- Opportunities to cut firewood.
- Opportunities to gather varied forest products, including berry picking and mushroom gathering.
- Opportunity to visit four Special Interest Areas set aside especially for public enjoyment of their recreational, scenic, botanical, and scientific qualities.
- Opportunity to visit four major undeveloped and scenic river systems which are candidates for Wild and Scenic River Designation.

Following are a sample of recreation attractions that illustrate the wide range of services available. The following map depicts the location of the major recreation sites on the Forest.

Timberline Lodge: The Lodge was constructed at the 6,000 foot elevation on the south face of Mt. Hood during the 1930's as a project for the Works Progress Administration (WPA). Over the years the Lodge has become recognized as an outstanding attraction. Its location on the side of a mountain, its Cascadian architecture and especially its art work are unique. Artists hired by the WPA incorporated their work into the design and construction of the building. A new day lodge to accommodate skiers was constructed in 1981 to save wear and tear on the original Lodge and help in the preservation of its special art. Today the Lodge hosts more than a million visitors each year. The original Lodge was designated a national Historic Landmark in January, 1978.

Cloud Cap Inn: A National Register Site, Cloud Cap Inn sits on a rocky point at the 6,000 foot elevation on the northeast slope of Mt. Hood. The Inn was designed by William H. Whidden and Ion Lewis and was constructed in the summer of 1889. That same year Chinese Labor built the first road access to the Inn which was then the first resort on Mt. hood. In 1940, when a private group could not be found to operate the lodge, the Forest Service bought it in recognition of its historic importance. The Inn was placed on the National Register of Historic places in 1974.

Ski Areas: The Forest has five developed ski areas that are easily accessible year around via major highways. Two of these areas, Mirror Mountain and Timberline, operate summer facilities in addition to the winter ski runs and other amenities. Mirror Mountain has a summer Alpine Slide and Timberline offers summer ski runs on Palmer snow field.

Multnomah Falls Lodge: This Lodge has been a popular visitor attraction since it was built by the City of Portland in 1926. In the late 1920's excursion trains carried visitors up the gorge to visit the Lodge and falls. Today, according to "Driving Pleasure", the Lodge and Multnomah Falls are the most visited sites in the State of Oregon. More than two and a half million visitors arrive each year. The City of Portland gave the Lodge to the Forest Service in 1943. The Lodge and its grounds have recently undergone extensive restoration and improvement. The Lodge is on the National Register of Historic Places.

Columbia River Scenic Highway: The Columbia River Scenic Highway was considered an engineering marvel when it was constructed in 1915. Today, remaining segments of the old highway are popular with visitors who want to view the Gorge at a more leisurely pace than is possible on the interstate highway. In 1984, the scenic

highway was designated a "National Historic Civil Engineering Landmark" through the efforts of the American Society of Civil Engineers.

Barlow Road: This road was pioneered by the Barlow family in 1846 as an alternate route to the Willamette Valley for Oregon Trail immigrants who did not want to float down the dangerous Columbia River. As a transportation route in Oregon, the Barlow Road was the State's longest-operated, private toll road. By 1903 the first automobiles used the route, but by the 1920's the construction of Highway 26 ended the use of the Barlow Road. However, the new highway followed the old Barlow road route for much of its length so that today about half of the length of the original Barlow Road can still be travelled. Several segments still remain as they were when the original road was abandoned as a travel route. The Barlow Road is an integral part of the fabric of the economic and cultural history of Oregon. The Laurel Hill segment of the route and the Tollgate near Rhododendron have been nominated to the National Register of Historic Trails. As part of the Oregon trail, the Barlow Road is a designated National Historic Trail.

This section of the chapter focuses on recreation opportunities in general, and demand for recreational use of the Forest's resources. Later sections of this chapter discuss wilderness, special interest areas, and wild and scenic rivers in more detail.

b. Existing Situation

(1) Type of Use

In a typical year millions of visitors come to the Forest. In 1986, for example, nearly 7 million recreational visits were recorded, which equaled 4.7 million "Recreation Visitor Days" (RVD's). A Recreation Visitor Day, or RVD, is 12 hours of visitor recreational use in any combination of people or hours. If 1 person visits the Forest 12 hours, that is 1 visitor day. Or if 12 people visit the Forest 1 hour, the result equals 1 visitor day.

The accompanying table presents the recreation visitor days occurring on the Forest and summarizes the most popular recreational activities on the Forest. Activities listed occurred over the whole range of the Recreational Opportunity Spectrum (ROS) which will be taken up in detail in the next part of this section. According to current estimates of activity, driving for pleasure, camping, and viewing the scenery account for more than half of the total recreational use of the Forest's resources.

Table III-31

Recreation Visitor Days (RVD's) According to Activity^{1/}
(Fiscal Year 1986)^{2/}

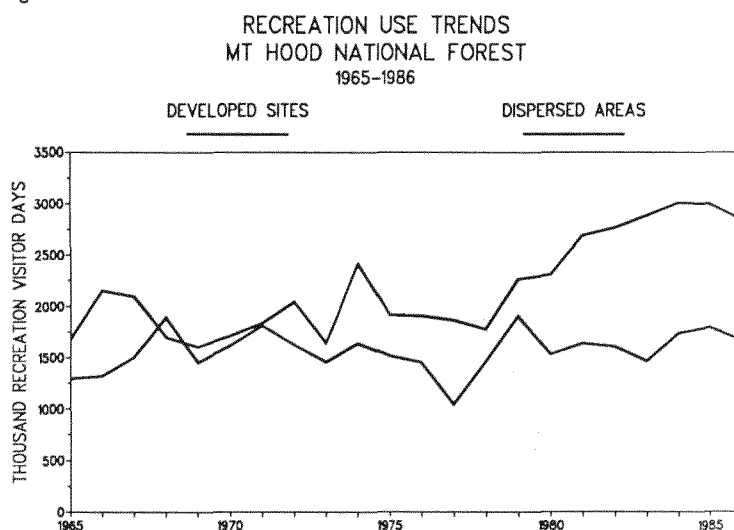
USE ACTIVITY	RVD's	USE ACTIVITY	RVD's
Driving for Pleasure	860,100	Hunting	87,900
Camping	819,200	Picnicking	74,800
Viewing Scenery	614,500	Motorcycle and Scooter Use	66,800
Gathering Forest Products	279,800	Nature Study	53,500
Downhill Skiing	275,000	Canoeing, other small Watercraft	41,900
Hiking and Walking	316,700	Using Interpretive Programs	42,700
Fishing	148,100	Snowmobiling	36,100
Resort Use	136,000	Horseback Riding	26,300
Bus Touring	150,200	Snowplay (incl. Sledding and Tobogganing)	25,000
Cross-Country Skiing	98,500	Swimming and Water Play	44,400
Recreational Cabins	130,600	Power Boating/Sailing	25,000
		TOTAL RVD's	4,353,100

1/ 1986 Recreation Information Management (RIM) Estimates, Report No. 2300-1.

2/ A fiscal year runs from October 1 through September 30.

Recreational use of the Forest is one of its important benefits. According to a Forest Service RIM report for the year 1984, it ranked eighth in the Nation in total RVD's and 28th out of 123 national forests in total recreation receipts. In 1984, more than two million people visited Multnomah Falls making it the most popular feature on the Forest, and the most popular highway stop in Oregon. Timberline Lodge drew more than a million visitors in 1981, making it the second most popular attraction on the Forest. The following graphs indicate the regional recreation use trends for the Pacific Northwest Region and the Forest.

Figure III-10a



MAJOR RECREATION SITES

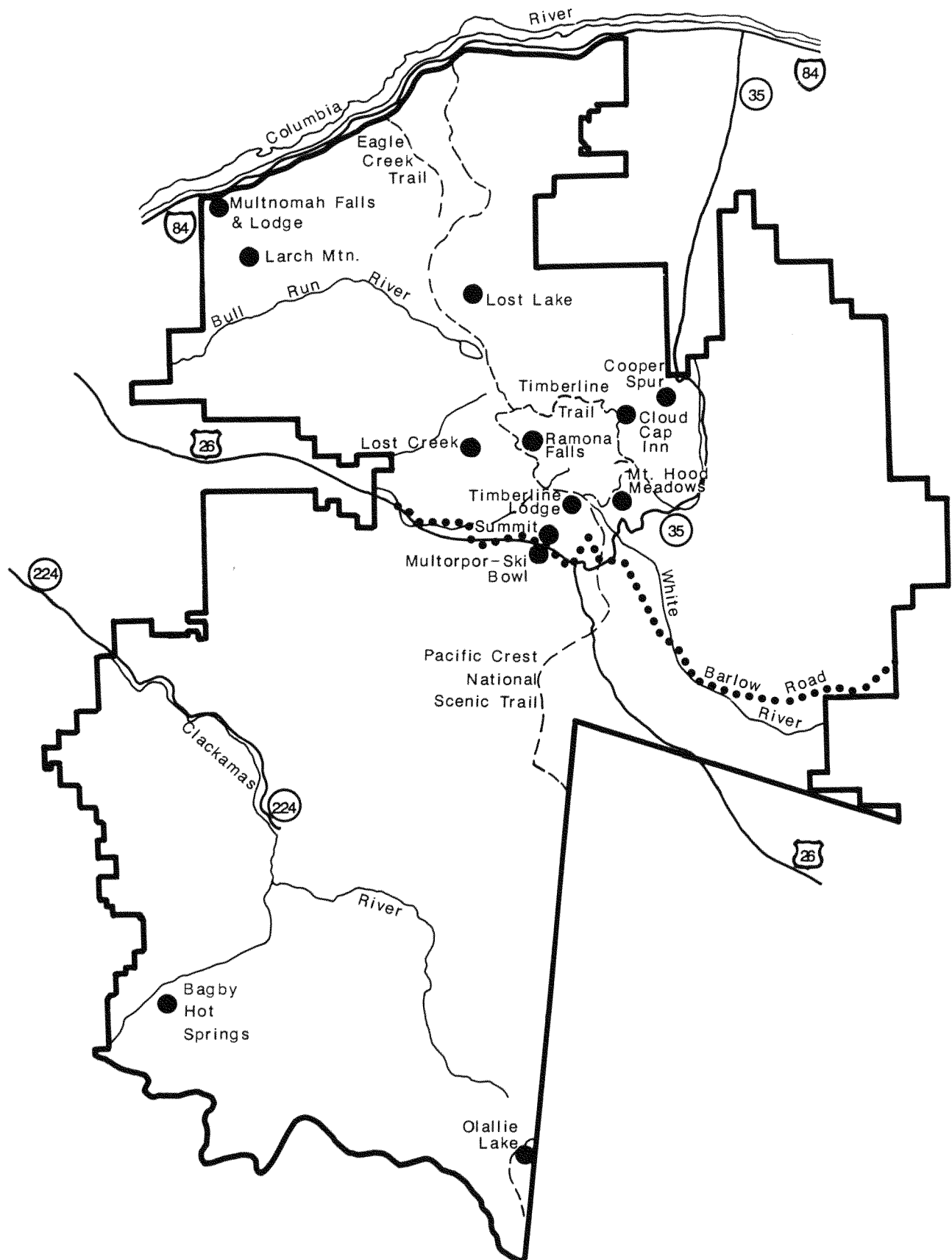
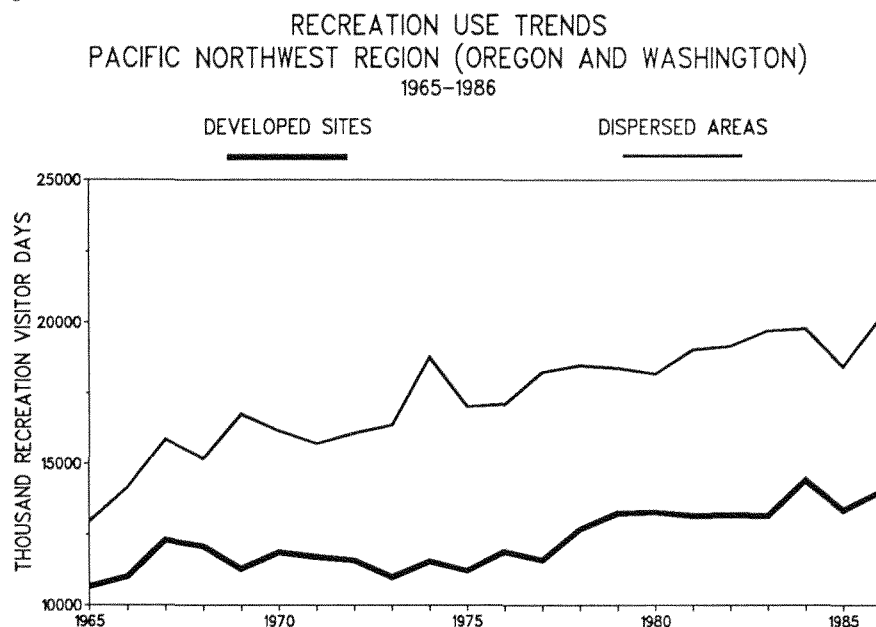


Figure III-10b



2. Semi-Primitive, Nonmotorized (SPNM)
3. Semi-Primitive, Motorized (SPM)
4. Roaded Modified (RM)
5. Roaded Natural (RN)
6. Rural (R)
7. Urban (U)

Primitive (P): Primitive opportunities occur in an unmodified, natural environment with little or no interaction with other users, or evidence of other uses. The chance of experiencing solitude is very high. Self-reliance is required. Travel is by foot or pack stock on trails or cross country.

Semi-Primitive Nonmotorized (SPNM): SPNM experiences take place in predominately natural-appearing environments of moderate size in which

other permanent structures are rare. Interactions between users are low; there is no motorized usage. The chance of experiencing solitude is fairly high.

Semi-Primitive Motorized (SPM): Opportunities for recreational experiences are provided by natural environments similar to those in SPNM areas except that off-road vehicles are permitted. The chance of encountering them is probable. Disturbance of the environment by people is more evident. Users will interact with other people to a greater degree resulting in somewhat reduced chances of experiencing solitude.

Roaded Modified (RM): In these roaded environments vegetation has been substantially modified, some self-reliance may be required, and developed campsites usually are not available. Roads, timber sale landings, logging slash, and debris may be very evident; however experiences are usually accompanied by feelings of independence and freedom. Moderate interaction with other users is probable.

Roaded Natural (RN): Opportunities for recreation occur where the environment appears predominately natural as seen from places where people are most likely to visit. Permanent roads, including highly traveled roads, improvements like developed recreational sites and certain trails, are common. These usually harmonize with the environment. Minimum facilities are provided in campgrounds. Interactions with other people may be fairly high, therefore the chance of solitude is low.

Rural (R): In this setting the natural environment has been highly modified yet it remains attractive. Good roads, buildings, and other improvements are typical. Opportunities for interactions with other people are very great.

(2) Type of Opportunities: Recreation Opportunity Spectrum (ROS)

The inventory system used by the Forest Service to classify recreation opportunities is called the Recreation Opportunity Spectrum (ROS) system. This system describes seven categories of recreational settings available to people in which they are offered a spectrum of recreational activities during their visit. Criteria used in the ROS inventory of the Forest included:

- Opportunities for solitude and encounters with other people.
- The degree of site development.
- The chances of challenge and risk.

As shown by the criteria, the ROS system emphasizes the experience of the recreational visitor rather than the site's overall characteristics. For example, the edges of a Wilderness or unroaded area may be affected by nearby, heavy recreation uses which minimize the opportunity for solitude. In the ROS spectrum, such an area would be classified "Roaded Natural" even though it does not contain any roads. An actual example of this situation is the Eagle Creek Trail in the Columbia Gorge. The trail is crowded with hikers on most summer weekends and holidays and is therefore classified "Roaded Natural".

Beginning with an undisturbed, natural environment with little or no contact with other people, and ending with a substantially modified environment with a large number of contacts with other people, the seven categories of the ROS system are:

1. Primitive (P)

Many facilities have flush toilets, lighting, and piped-in water for public convenience. Except for downhill skiing, few challenges or risks are available.

Urban (U): These settings are characterized by complex facilities. Interaction with other people is very important to the visitor, as is the convenience of improvements and recreation opportunities. A natural-appearing backdrop may be present, but the environment is urbanized to the extent of paved streets and even traffic lights. City parks or resorts illustrate the nature of this ROS category.

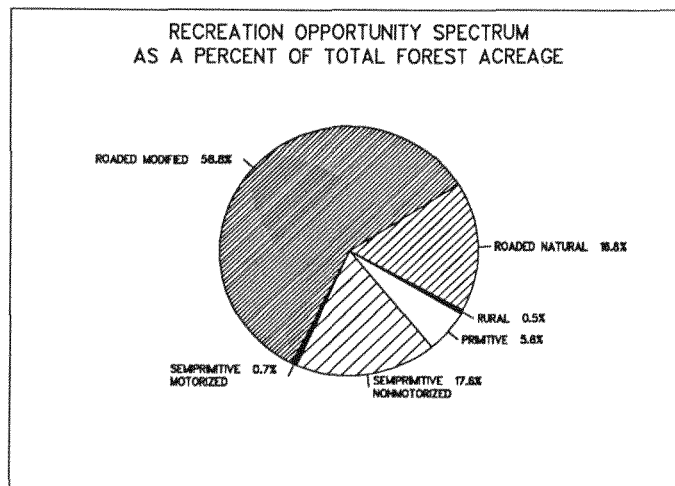
Public access to the Bull Run Watershed is currently forbidden. The remainder of the Forest has been inventoried for its recreation opportunities. The results are included in the following table, and accompanying graph.

Table III-32

Existing ROS Condition of the Forest (excluding The Bull Run)

ROS CATEGORY	ACRES OUTSIDE THE BULL RUN	PERCENT OF TOTAL
Primitive	53,474	5.6%
Semi-Primitive Nonmotorized	168,486	17.6%
Semi-Primitive Motorized	7,466	0.8%
Roaded Natural	160,060	16.8%
Roaded Modified	560,446	58.7%
Rural	5,077	0.5%
Urban	42	<0.01%
Total	955,051	100%

Figure III-11



c. Relationship to the Natural Environment

The natural environment of the Forest is the key to its benefits as a place for recreation in the outdoors. However, the impact of human beings on the natural world may often be negative. The changes may be small and subtle, or large and intrusive depending mostly on the degree

and frequency of the impact. For instance, hiking compacts the soil on Forest trails, but this impact is less than from ORV's. Although both activities cause compaction, the difference in degree is substantial.

The impact of highly developed sites is intense though localized. Construction on the site disturbs natural plant cover. Some wildlife species are displaced. Heavy human use can compact or erode the soil with further damage to plant cover. People normally congregate in developed sites to such an extent that they can deplete local, natural resources such as fish. Concentrations of waste and refuse on developed sites can pollute ground or surface water.

Dispersed recreation usually has a less intense impact spread over a large area. Popular areas which receive heaviest use are more likely to experience negative effects than are lightly used ones. Environmental changes usually become more serious at higher elevations where the climate is severe and the soil may be fragile. Cross-country travel, especially when hikers attempt to shortcut the switchbacks on steep trails, can cause visible damage by trampling plants and disturbing the soil. Recreational travel on roads and trails limits the human impact on soil and vegetation.

The self-reliance required for recreation away from developed campgrounds may produce further changes in the natural environment. Examples include building fire rings or disposing of human wastes. Such changes are more evident where the area is undeveloped than they are where sites have obviously been modified.

d. Relationship to the Human Environment

Large numbers of people in metropolitan Portland, as well as those in other communities near the Forest, look upon it as their main source of outdoor recreational opportunities. Communities do not always agree, however, on the types of recreation that should be emphasized. The differences in recreational interests sometimes create conflicts. Motorized uses of trails conflicts with nonmotorized uses. Cross-country skiing may conflict with snow-machine skiing. People who want full hookups in developed sites do not enjoy the same activities as people who want primitive or rustic experiences.

Roads built to meet the Forest's management objectives are used by visitors for sightseeing or travel to campsites, trailheads, or their favorite areas for hunting, fishing, and other activities. Roads can obviously change the type and availability of recreation opportunities in an area. If roads increase roaded opportunities, they simultaneously decrease unroaded ones. The section on transportation in this chapter provides additional information on this subject. Increases in demand for recreation on the Forest are expected to be in proportion to increases in the population of surrounding areas. Future demand should be largest on the

west side of the Forest along or near major routes of access, such as Interstate 84 in the Columbia Gorge. Little increase in demand should come from the east side of the Forest even though an upward trend is evident. Wasco County, for example, accounts for only 2% of the total recreation on the Forest although it includes the eastern parts of the Hood River, Bear Springs, and Barlow Ranger Districts. An accompanying table summarizes the Forest's ability to meet total recreation demand in RVD's projected to the year 2030.

The numbers for developed and dispersed demand are predicated on average use per year. This average is sometimes exceeded under peak flow conditions (for example, some weekends during the summer).

There are different types and locations of recreational experiences within the broad categories of developed, dispersed, and wilderness recreation. Within these sub-categories, there may be shortages. For example, although the Forest can meet overall demand for developed recreation during the next 15 years, it may already have a short supply of picnic sites around Multnomah Falls.

Table III-33

Ability to Meet Recreation Demand in RVD's Per Year ^{1/}

ACTIVITY	PRACTICAL ^{2/} CAPACITY	CURRENT USE	DEMAND BY YEAR 2030 ^{5/}	DEMAND IN 2030 AS % OF CURRENT PRACTICAL CAPACITY
Developed Rec ^{3/}	3,042,300	1,453,900	2,873,300	94%
Dispersed Rec	8,524,300	2,728,100	5,127,000	60%
Wilderness ^{4/}	143,632	166,500	286,000	199%
TOTALS	11,752,600	4,348,500	8,594,200	73%

^{1/} Current use and demand projections based on 1983 Recreation Information Management (RIM Estimates, Report No. 2300-1).

^{2/} The practical capacity is the theoretical maximum capacity which has been adjusted downward to account for factors that significantly affect recreation use. These factors include weather conditions (e.g. snow), the difference between weekend and weekday use, the physical ability of the site to withstand environmental damage, and the actual usable acres of a site, for example, swampy or brushy areas).

^{3/} Includes Privately-Operated Sites.

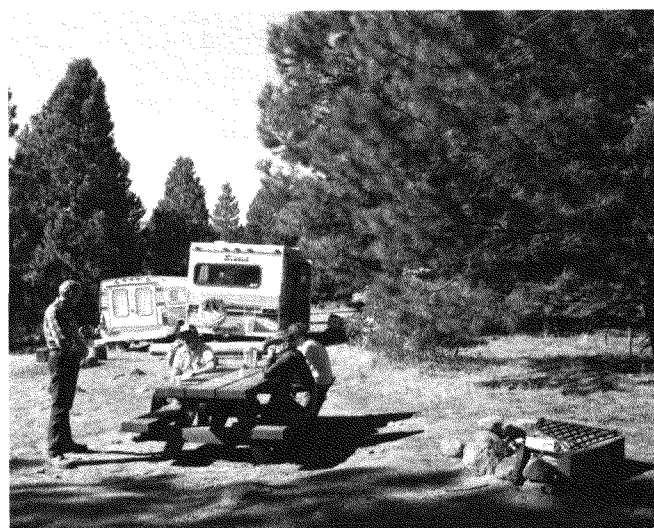
^{4/} Based on a wilderness carrying capacity coefficient of .75 RVD/AC/YR in the primitive trailed zone and 1.0 RVD/AC/YR in the semi-primitive trailed zone.

^{5/} Historically, increases in recreation use on the Forest have approximately 1.5% per year (Based on Regional Data specific to the Mt. Hood Forest).

e. Developed Recreation Management and Facilities

Developed recreation, as this term applies to the Forest, means any recreation occurring on a site with facilities which accommodate recreational visitors. These sites may be highly developed with sophisticated facilities, or they may have minimum development and provide only the kinds of facilities needed to protect public health and safety.

(1) Forest Service Developed Site facilities The Forest has a wide variety of developed recreation sites. A total of 152 developed sites on the Forest have a practical capacity of more than three million RVDs per year. These sites include campgrounds, picnic grounds, boating facilities, visitor information centers, winter recreation areas, organizational camps, and summer homes. A variety of other types of facilities are available on the Forest, including picnic sites, boating facilities, and visitor information facilities. A few campgrounds offer specialized facilities. Joe Graham, Herman Creek, and Riley horse camps have corrals and facilities for unloading horses. Thirty-one of these developed sites have facilities available for physically handicapped persons. Most of the specialized facilities are campgrounds or picnic grounds although an observation facility and a boat launch have been constructed. Information about campgrounds and other developed recreation sites is available at Visitor Information Centers at Multnomah Falls and Timberline Lodge, at Ranger Stations, and at Olallie and Clackamas Lake Guard Stations. Approximately 1 1/2 million RVDs of recreation within developed sites were recorded for the year 1983.



Developed recreation.

The current use of most of the developed recreation sites on the Forest now equals or exceeds their practical recreation capacity. The continuing recreational use of the Forest's developed recreation sites at levels that equal or exceed their practical capacity and type of use the sites were designed for has caused deterioration, and rehabilitation of most developed sites has become necessary. Because current use of existing sites greatly exceeds practical capacity, the only realistic way to meet the demand is to rehabilitate and expand the existing developed sites or add new developed sites.

Currently operation and maintenance of existing developed sites are at a substandard level that meets only minimum requirements for public health and safety and will not maintain existing facilities over time. At this level no funding has been provided for upgrading of facilities or completion of backlogged rehabilitation needs.

Based on 1983 RIM information, the total backlog presently needed to rehabilitate existing developed sites to Condition Class 1 has been estimated at \$5.7 million. For a developed facility to be in Condition Class 1, it must be in satisfactory condition which is safe and sanitary, and its annual maintenance cost must not exceed 10% of replacement cost. This estimated cost includes the costs for sites developed and operated by the Forest Service, and costs for sites on the Forest's lands operated by private enterprises. To rehabilitate or maintain existing sites in good condition protects capital originally invested in site facilities, and usually costs far less than building new sites or expanding existing ones.

Although this less than ideal situation now exists because of past funding limitations, it is the Forest's intention to provide the quality of recreation which the public seeks.

(2) *Winter Recreation Facilities.* The Forest has five downhill ski facilities with a total practical capacity of 703,000 RVDs per season. This appears sufficient to meet current demand. All ski areas are within a drive of two to three hours from Portland, and are used mainly by nearby residents on a day-use basis. Timberline Lodge, however, attracts a limited number of overnight visitors. Cooper Spur, the area most distant from Portland, is used mainly by residents of the Hood River community. Mirror Mountain, formerly called Multnomah Ski Bowl, is on the west side. The largest ski facility, relatively new and possibly the most popular, is Mt. Hood Meadows. Summit Ski Area is a small facility with one run and one lift.

Private individuals or firms operate all downhill skiing facilities on the Forest under Special Use Permits. The two lodges at Timberline are owned by the Forest; the others are owned by the permittees. Timberline Lodge is somewhat of a special situation because it has been designated a National Historic Landmark. A second lodge for day-use only was completed in 1981 when heavy use of

the main lodge by skiers threatened to wear it out. The Forest has approved master plans for current and future development of ski facilities at Timberline, Mirror Mountain, Mt. Hood Meadows, and Cooper Spur.

(3) *Privately Operated Facilities.* A total of 589 facilities, with an estimated capacity of more than two million RVDs, are privately operated on the Forest under Special Use Permits. Some of these facilities are available for public use. Others operate for the benefit of individuals or members of a group. A restaurant and gift shop at Multnomah Falls are owned by the Forest Service, but a permittee operates them as public facilities. Privately operated resort facilities are open at Lost Lake and Olallie Lake. Some organizations have set up camps for their members on the Forest. Individuals may own summer homes on the Forest if they have the required permit. Suitable sites for snowplay areas and cross-country skiing on the Forest are so limited and popular that demand exceeds supply.

(4) *Non-Forest Recreation Facilities.* Direct relationships between the demand for off-Forest facilities and the demand for Forest facilities do not exist. The two types of facilities offer different types of recreational opportunities and require different amounts of travel time. However, it seems clear that if recreation opportunities available from off-Forest sources remain at their present level or decrease, any excess in recreation demand would displace to the Forest.

Present opportunities for recreation in areas immediately adjacent to the Forest are primarily limited to day-use facilities. Overnight accommodations are provided only by a limited number of state parks, local community parks, a few private RV parks and campgrounds, privately owned motels, and private off-Forest residences. Opportunities for off-Forest recreation, however, is not restricted to the immediate vicinity of the Forest. People seeking outdoor recreation, primarily in metropolitan Portland areas, travel to a number of different places ranging from the Oregon coast to eastern Oregon and participate in a highly diversified mixture of activities. Recreation opportunities alternative to those provided on the Forest should therefore be acceptable anywhere within reasonable travel distance.

Public recreation opportunities appear to be declining on a state-wide basis, and overnight camping accommodations appear to be in especially short supply. Some private campgrounds suitable for RVs and tents are being converted to limited membership operations. Some dispersed camping areas with historically high use suffer from site degradation and are being closed to overnight stay. Many of the state parks have initiated a reservation system for overnight stay, and they typically fill to capacity on summer weekends.

Expansion of privately owned facilities to meet increased demand is always a possibility. If this were to occur, areas near present recreational sites like the Sandy River, the Clackamas River, and the Hood River are the most logical places for development. Other possible opportunities for expansion in the private sector remain unknown at this time. The most important consideration is that the Forest's location within a two-hour drive from metropolitan Portland puts it in a natural position to receive much of the overflow when private facilities are filled.

(5) *Developed Recreation according to ROS Classes.* As shown in the accompanying table, developed recreation does not occur in Primitive, Semi-Primitive Non-Motorized, or Semi-Primitive Motorized areas. All developed recreation takes place in the remaining four ROS (Recreation Opportunity Spectrum) classes. The table shows how developed recreation is distributed by ROS-classified sites.

Table III-34

Current Use of Developed Sites by ROS Classes

ROS CLASS	RVD's	% OF TOTAL
P	0	0%
SPNM	0	0%
SPM	0	0%
RN	843,650	58%
RM	34,100	2%
R	388,950	27%
U	187,200	13%

(6) *Management Concerns* One of the most important concerns of Forest management is the relationship between the capacity of Forest recreational facilities and public demand. According to Recreation Information Management (RIM) estimates, total demand for developed recreation, including Forest sites and privately owned facilities, is now at 48% of total capacity. Demand is projected to reach 94% of that capacity by the year 2030. Projected demand for developed sites managed exclusively by the Forest will exceed capacity by the year 2006, while the demand on privately owned sites is scheduled to reach only 78% of private capacity 24 years later. The projected shortfall of sites managed by the Forest is aggravated by the uneven distribution of demand throughout the year. Some popular developed sites like Lost Lake, Trillium Lake, the Timothy Lake area, and the Clackamas River drainage are often pushed to extremes during summer weekends and holidays. Also, the especially heavy use of Timberline Lodge and Multnomah Falls adds to the unbalanced distribution of demand.

Table III-35

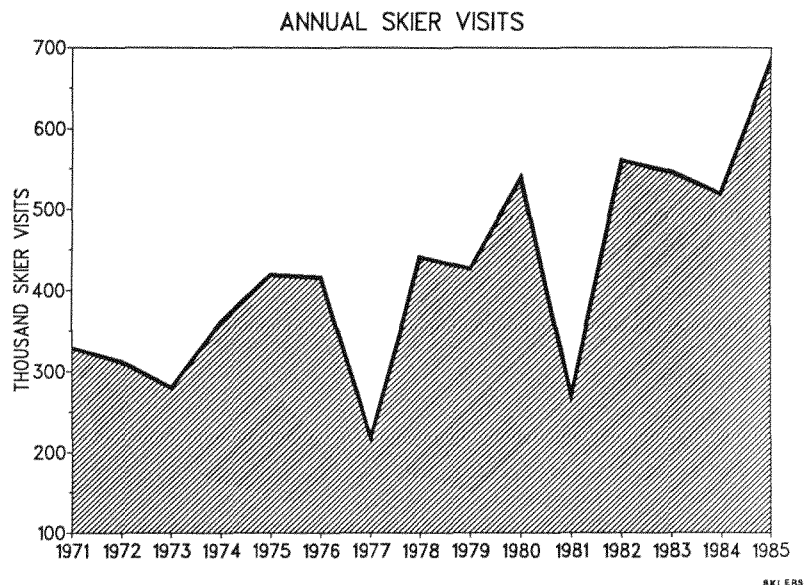
Projected Recreation Demand Outlook for Developed Sites in Recreation Visitor Days Per Year

TYPE OF SITE	PRACTICAL CAPACITY	CURRENT USE	CURRENT USE AS % CAPACITY	NO. YEARS TO REACH CAPACITY	DEMAND BY YEAR 2030	DEMAND AS % OF CAPACITY
FS Managed Sites	959,239	632,728	66%	26	1,250,461	130%
Privately Operated Sites on Forest	2,083,061	821,172	39%	79	1,622,839	78%
Totals	3,042,300	1,453,900	48%	56	2,873,300	94%

Source: Current use represents 5 year average (1979-1983) of Recreation Information Management (RIM) Estimates.

Another management concern is the relationship between the demand and supply of facilities for downhill skiing. At present, demand appears to be increasing. During the 1984-85 season, the total skier visits to the five ski areas on the Forest was estimated at approximately 684,000. According to a review of ski area usage over the past decade, downhill skiing on the Forest has historically increased at the rate of about 6% per year. Analyses of skiing-use patterns for the Forest indicates that use tends to increase in tandem with increases in ski area capacity, except for years with poor snowfall. An accompanying chart shows skier visiting data beginning with the year 1970.

Figure III-12

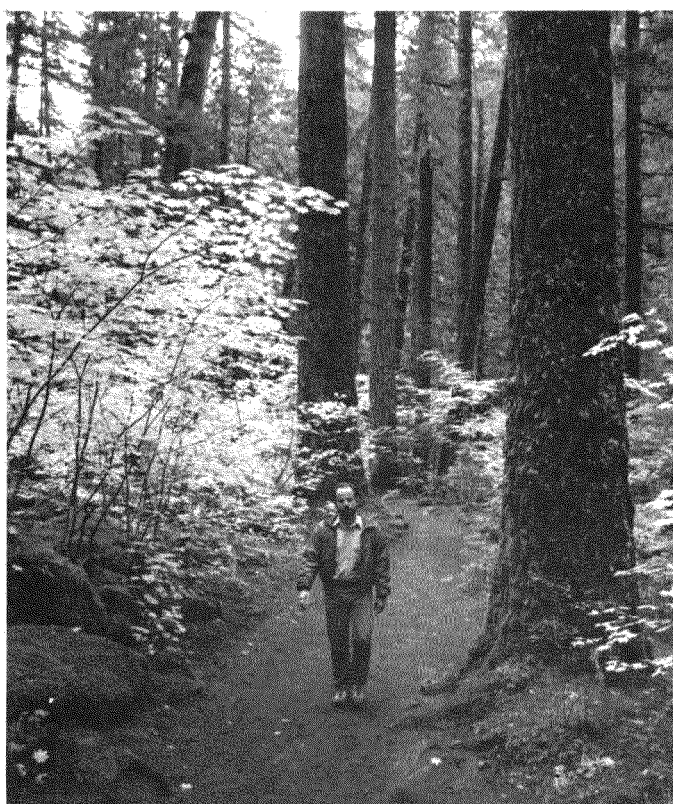


f. Dispersed Recreation Management

Dispersed recreation, as this term is used on the Forest, means any recreational activity that occurs outside sites developed or managed to concentrate recreation uses. Dispersed recreation may be motorized or non-motorized.

Current opportunities for dispersed recreation on the Forest are quite diversified, ranging from backcountry hiking or mountain climbing to driving for pleasure or camping in recreational vehicles. Visitors who come to the Forest in different physical conditions, with varying interests and different levels of outdoor skills, usually can find much to do.

(1) *Existing Situation.* Prior to the 1960's, access to many parts of the Forest was by horseback following an extensive trail system. In recent years, roads replaced many of these trails or they were abandoned. Although most of these remaining trails and trail segments have not been maintained, a few have survived and still retain much of their original character.



Backcountry hiking

The Forest's existing trail system, totalling 1,202 miles, makes possible a variety of dispersed recreation activities including hiking, backcountry camping, horseback riding, off-road vehicle (ORV) driving, cross country skiing, and snow machine use. The total includes 165 miles of winter trails managed for cross country skiing and snow machine use, and 257 miles of trails in Wilderness. An additional 131 miles of abandoned or non-maintained trails on the Forest are inadequate and do not meet current standards.

Visitors interested in mountain hiking or climbing can find trails varying in difficulty from easy to rugged and challenging. The number of people who climb Mt. Hood

each year is estimated to exceed 10,000. Since a number of trails, including many in the Columbia Gorge, are below the levels of snow accumulation, hiking opportunities are available the year around.

The level of maintenance of most trails at present is to retain their basic condition. With trail use predicted to increase, there is a opportunity to improve the existing miles of trails. In addition through revision of existing or completion of District trail development plans, opportunities for additional miles of trail to compliment or improve the present system will be identified.

The accompanying table summarizes the miles of trails managed by each Ranger District. At the present time, the trails identified as inadequate need to be reconstructed. These miles contribute to the backlog rehabilitation needs for the dispersed and wilderness recreation programs.

Table III-36

Forest Recreation Trail Mileages by Ranger District and Type Trail

EXISTING SYSTEM						INADEQUATE TRAILS ^{2/}			TOTAL MILES		
DISTRICT	NRT 1/	ADEQUATE MILES		WILDER-NESS TRAILS	SUMMER TRAILS					WINTER TRAILS	
		PACIFIC CREST NATIONAL SCENIC TRAIL	WILDER-NESS	OTHER				WILDER-NESS	OTHER	WINTER	
Barlow	12				33	58			28	14	145
Bear Springs				32	1	17	75 ^{3/}			40	165
Clackamas	5	4	24			69			41		143
Col. Gorge		14	7	29	139				16	37	242
Estacada					35	69			49	8	161
Hood River			14	53	68	25	5	6		14	185
Zigzag	17	10	6	78	50	76	6	31	18		292
TOTAL MILES	34	28	83	229	470	3/ (165) 176	11	171	131	1 333	

1/National Recreation Trail-designation by Congress or administrative act.

2/A trail that does not meet current construction or maintenance standards.

3/Winter trails in this category include 9 miles of trails that are used in summer and are included in Summer trails miles total for this District.

(2) Off-road Vehicle (ORV) Recreation. According to 1984 Recreation Information Management (RIM) Estimates, Report No. 2300-1, ORV-based recreation on the Forest currently accounts for only 2% of the recreation total. However, this form of recreational use of the Forest is increasing in popularity. A variety of ORVs are used including four-wheel drive vehicles, motorcycles, all-terrain vehicles, and snow machines. At this time ORVs are primarily limited to the existing system of roads and trails, the exceptions being some areas on the east side of the Forest.

In compliance with Executive Order 11644 dated February 8, 1972, issued to provide for a unified federal policy toward ORV use, the Forest prepared an ORV Management/Use Plan. As approved December 1976, this plan was designed to assure that the use of ORVs will minimize damage to the environment, promote the safety of users, minimize conflicts with other users of the Forest, and provide a high-quality recreational experience for both ORV and non-ORV users. The recommendations incorporated into the existing ORV Plan resulted from Forest Service/User Group interaction during the ORV planning process. At present, ORVs are permitted Forest-wide, except where designated areas have been closed or restricted under the Plan. However, the ORV Plan and policy are being revised as described in Appendix C of the Forest Plan. The total capacity for ORV uses on the Forest is not known at this time. Estimates of future ORV demand are summarized in the accompanying table.

Table III-37

Estimated Future ORV Demand In RVD's Per Year

TYPE OF ORV USE	ESTIMATED CURRENT USE	ESTIMATED DEMAND BY YEAR 2030
Motorcycle Scooter	68,100	134,586
Snow Machine	35,800	70,752
Other	200	395
Totals	104,100	205,733

1984 Recreation Information Management Estimates, Report No. 2300-1

(3) *Dispersed Winter Recreation.* Cross-country skiing is the most popular form of dispersed winter recreation on the Forest. It also appears to be the fastest growing form of snow-based recreation nationally. Other important dispersed winter recreation activities include snow machine use, winter camping, winter climbing, and snowshoeing. Winter recreation in dispersed areas in 1983 was recorded to total 148,400 RVDs.

The most popular areas for cross-country skiing are located in the vicinity of Mt. Hood. Existing trails offer opportunities to match skills from beginning to advanced. Two special types of cross-country skiing, relatively new to the Forest, are telemarking and track skiing. Telemarking occurs mostly within developed ski areas, but the demand for groomed trails for track skiing is a rapidly growing need. Two areas offering this type of opportunity are the White River area and the Hood River Meadows area. A need for additional parking spaces has been identified.

(4) *General Dispersed Recreation.* The most popular dispersed recreation activities on the Forest are: driving for

pleasure, viewing the scenery, gathering forest products, and hiking. Day-use activities dominate the dispersed recreation use of Forest areas. Trips of one day up the Columbia Gorge, over the Mt. Hood Loop, or through the Clackamas River Corridor are quite popular. These one-day trips offer a variety of things to do from fishing to taking short hikes or just enjoying the landscape.

Opportunities for recreational fishing on the Forest range from trout fishing in streams and lakes to the pursuit of anadromous fish like salmon and steelhead in large rivers. In the most accessible trout fishing areas, the catch depends mainly on planted fish, but the fishing for native types can be excellent for anyone willing to walk a few miles. Success in catching salmon and steelhead depends primarily on the timing of the fish runs. Most recreational fishing for anadromous species occurs just off the Forest in the Clackamas, Sandy, Hood, and Salmon Rivers. However, a substantial summer steelhead fishery in the upper sections of those rivers has developed within the Forest in the last few years.

Recreational hunting opportunities on the Forest are varied. The most popular game species are: deer, elk, grouse, mountain quail, turkey, and silver-gray squirrels. The most popular big-game hunting on the Forest is for blacktail deer.

Although some visitors engage in canoeing, kayaking, and rafting on some of the larger lakes and the Clackamas River, water sports are not an especially important Forest activity at this time.

(5) *Dispersed Recreation by ROS Classes.* The distribution of recreation uses between Recreation Opportunity Spectrum (ROS) classes appears consistent with the overall pattern of recreational use of the Forest, in which more than 90% of the activities are motorized. The distribution of dispersed recreation by ROS classes:

Approximately 79% of the total occurs within areas classified as Roaded Natural and Roaded Modified.

An estimated 10% of the dispersed use occurs within areas classified as Rural.

An estimated 8% is within areas classified as Semi-Primitive, Non-Motorized.

Semi-Primitive Motorized and Primitive ROS classes account for 1% and 2% of dispersed use respectively.

The Forest-wide ROS classification of trails shows that most of the trail mileage (37%) falls within the Semi-Primitive Non-Motorized class. Roaded Modified accounts for 31%, and Roaded Natural the final 23%.

(6) *Management Concerns.* As a general rule, dispersed recreation is not managed as intensively as developed recreation. Main concerns are periodic fire prevention and

winter recreation patrols. Some areas may be closed, and campfires restricted, in periods of high fire danger. Another concern is the relationship between demand and supply. The Forest appears able to meet projected demands for roaded, dispersed recreation, but the present capability to supply recreational opportunities such as hiking on trails in Primitive and Semi-Primitive Non-Motorized areas is predicted to fall short of satisfying demand. Current trends also indicate that the demand for some types of dispersed recreation facilities and services may exceed the Forest's future capabilities. Examples are demands for Sno-Park areas, trailheads, maintained trails, and backcountry patrols.

7. Proposed Wild and Scenic Rivers

a. Background

The Wild and Scenic Rivers Act of 1968 (Public Law 90-542) states:

Certain selected rivers of the nation which, with the immediate environments, possess outstanding remarkable scenic, recreational, geologic, fish, and wildlife, historic, cultural, or other similar values, shall be preserved in free-flowing condition, and that they and their immediate environments shall be protected for the benefit and enjoyment of present and future generations.

In response to the 1968 law, the National Park Service published in January, 1982, a Nationwide Rivers Inventory (NRI) which identified potential Wild and Scenic rivers in all of the United States.

b. Existing Situation

Portions of the Clackamas and Salmon Rivers located within the Forest were included in the Nationwide Rivers Inventory. Based on public input, the Forest proposed that parts of the Roaring and White Rivers be added as candidate areas. The Forest, therefore, has a total of four rivers identified as candidates for inclusion in the Wild and Scenic Rivers System.

(1) *Criteria for inclusion.* Formal inclusion of a river in the Wild and Scenic River System requires satisfactory completion of several steps in a detailed process. Step one is to determine if the river is eligible for inclusion by assuring that it meets two criteria:

- (a) It must be free-flowing.
- (b) With its adjacent land area included, it must possess at least one outstanding, remarkable value. Scenic, geologic, historic, cultural, ecological, or fish or wildlife habitats, are examples of such values.

The proposed river area boundaries were established using the following criteria:

(a) The length and width of the river corridor should be established to protect the "outstandingly remarkable values" previously identified.

(b) The river corridor should insure a meaningful experience.

(c) Topographic, geologic, and vegetative features plus visual considerations should be used to establish river corridor boundaries.

(d) In general, one quarter-mile on each side would be established as the minimum corridor width. Where justified, a lesser width may be proposed.

In step two of the process, the rivers are classified into wild, scenic, or recreation segments. Each proposed area would be classified according to the way it matches one of the following patterns:

(a) Wild River segments must be free of impoundments, generally accessible only by trail, with the watersheds or shorelines essentially primitive and the water unpolluted.

(b) Scenic River segments should be substantially free of impoundments, the shorelines and watersheds largely undeveloped, but accessible in places by roads.

(c) Recreational River segments may be reached easily by road, have some development along their shorelines, and have some history of impoundment or diversion.

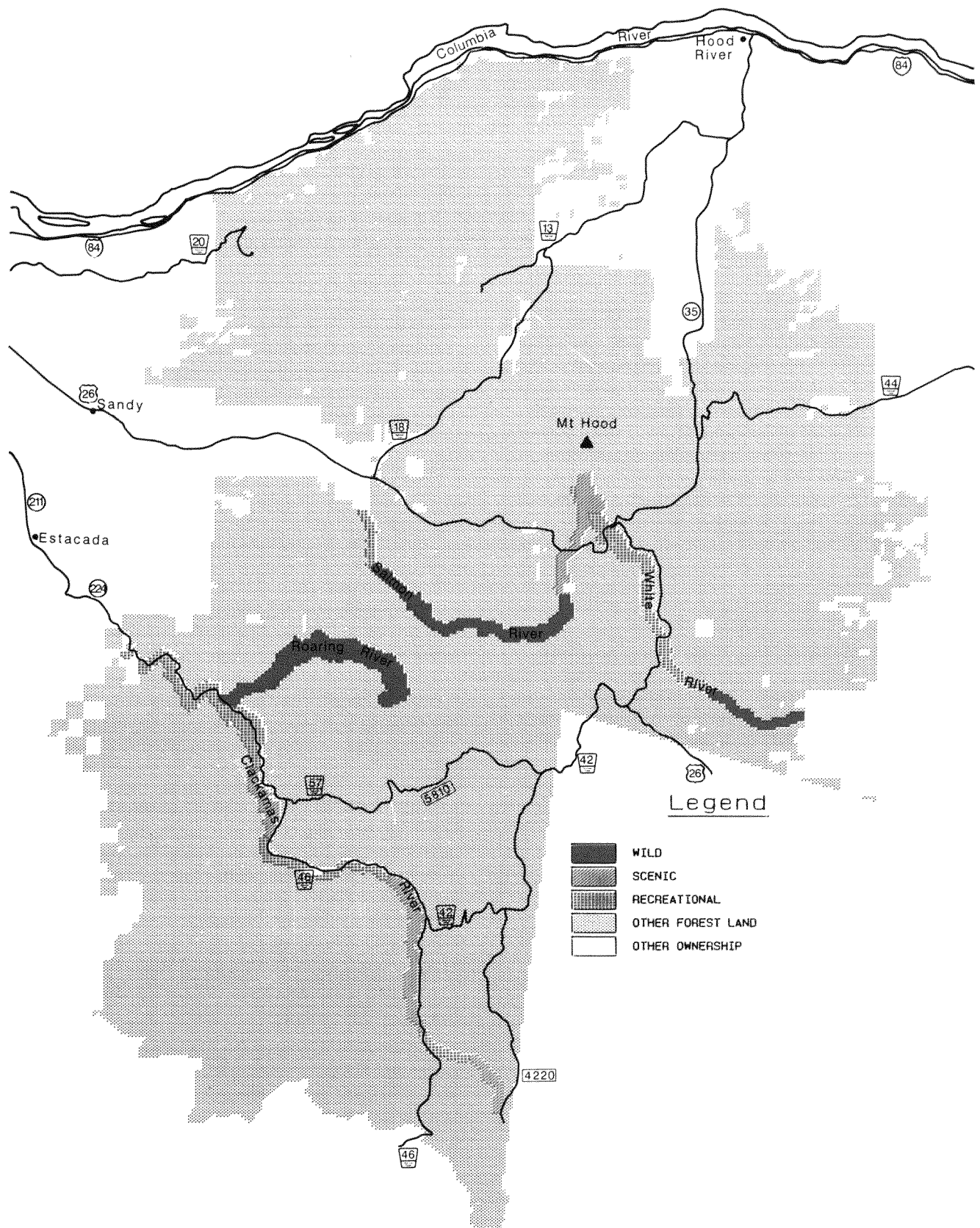
The final step in assessing the proposed river is to determine its suitability. This determination provides the basis for deciding to recommend designation or nondesignation as a candidate river. Potential candidate rivers recommended for designation as a result of the assessment procedure are subject to a further process of approval and ultimately legislative action by Congress.

The following brief sketches summarize the eligibility characteristics of the four rivers recommended by the Forest for further consideration and inclusion in the Wild and Scenic Rivers System.

(2) *Clackamas River.* The required assessment process has determined that a total of 47 miles of this River located within the Forest are eligible for potential inclusion in the Wild and Scenic System. Three segments totalling 20 miles have been classified Scenic. Another three segments totalling 27 miles have been classified Recreational. The River is known for sport fishing and outstanding opportunities for recreational rafting and kayaking. Its visual quality is high, with enormous old-growth timber and mossy cliffs which overlook the water. Camping and hiking opportunities adjacent to the river attract large numbers of visitors.

(3) *Roaring River.* A 13.5 mile segment of this river has been found eligible for potential inclusion in the Wild and Scenic Rivers System in the Wild category. An additional 0.2 miles has been classified Recreational. The outstand-

WILD, SCENIC, AND RECREATIONAL RIVER INVENTORY



ingly remarkable values of these segments are a primitive character, remote location, and lack of access by vehicle. Its scenery and fisheries are significant additional resources.

(4) *Salmon River*. Of a total of 25.5 miles, two segments of this river totalling 4.0 miles have been determined eligible for inclusion in the Wild and Scenic River System as Recreational. Another segment of 6.5 miles has been classified Scenic. Another segment totalling 15.0 miles has been classified Wild. This river's outstandingly remarkable values include the salmon and trout sport fishing, scenery which includes steep canyon walls and waterfalls, and a variety of attractive and sometimes unique vegetation along its banks.

(5) *White River*. Segments of this river fall into all three classifications for potential inclusion in the Wild and Scenic Rivers System. The largest segment totalling 13.6 miles has been classified Recreational. The Wild classification includes 6.5 miles. The smallest segment of 2.0 miles has been classified Scenic. The eligibility values of this river include spectacular views of snowcapped Mt. Hood and meadows lying below the peak. The open canyon bottom of the upper river offers numerous opportunities to enjoy these rare and beautiful views. Geologic values include clear evidence of the enormous forces which formed the canyon. Glacial scouring, sand moraines, and other geologic features are visible to the naked eye. Opportunities for summer and winter recreation abound. The broad upper river valley is a popular cross-country ski area, and there are several hiking trails in the area. Downstream, the river flows into dense forests before cascading over waterfalls into a narrow canyon, cutting through the dry flats east of the Forest.

c. Relationship to the Natural Environment

Designation of these rivers as Wild, Scenic, or Recreational would help to preserve their existing free-flowing characteristics, and their outstandingly remarkable values. Classifying them as Wild would be the most restrictive category as far as preserving the environment from the impact of human activity is concerned. The least restrictive would be the Recreational designation. Designation as Wild, Scenic, or Recreational would be expected to limit changes to designated river segments as prescribed in the management prescription (see Chapter IV for the Forest Plan). The impact on wildlife and fish should be positive by helping to preserve or enhance their habitats.

d. Relationship to the Human Environment

Without question, designation of significant parts of four rivers on the Forest to Wild, Scenic, or Recreation categories would have two major effects. One effect would be to assure the continuation of experiences difficult or perhaps impossible to find anywhere else. On the other

hand, each designation is restrictive to some degree, and therefore would impact other Forest opportunities.

e. Management Concerns

The Forest has received public concern regarding the designation of the four candidate rivers as "Wild and Scenic." The kinds of uses compatible within each of the three classifications are summarized in Appendix E of the DEIS.

8. Wilderness

a. Background

The Wilderness Act of 1964 established the nature of Wilderness:

A wilderness, in contrast with those areas where man and his own works dominate the landscape, is hereby recognized as an area where the earth and its community of life are untrammelled by man, where man himself is a visitor who does not remain.

The quotation above tells what Wilderness is, but not the reason for preserving it. The Wilderness experience incorporates a variety of benefits including ecological, scientific, geological, educational, scenic, and historical values. In Wilderness, one can experience solitude -- the becoming of one with nature. The Wilderness experience is bounded only by each person's individual limitations. It is, for many, a concept or ideal to be preserved even in the absence of direct experience. From this, it becomes clear that Wilderness values can be highly subjective. Benefits can be colored or limited by such factors as one's economic point of view, social philosophy, personal learning, cultural heritage, institutional teachings, and day-to-day associations.

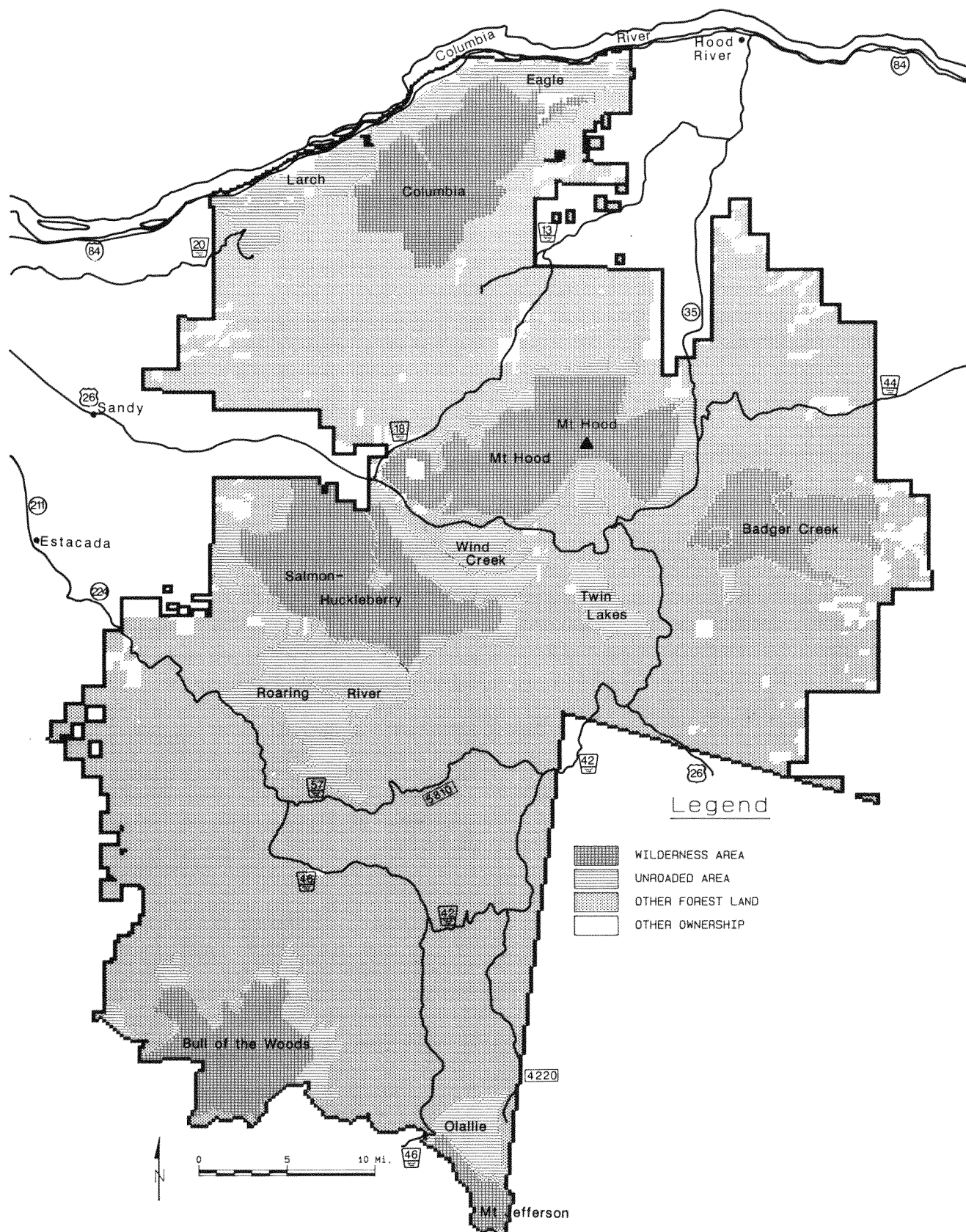
b. Existing Situation

Six Wildernesses on the Forest occupy approximately 186,000 acres, representing nearly 17% of the total land mass.

The Mt. Hood Wilderness was established by enactment of the Wilderness Act of 1964. In 1984, the Oregon Wilderness Act added Badger Creek, Columbia, Bull of the Woods, and Salmon-Huckleberry as new Wildernesses. A small part of the Mt. Jefferson Wilderness, established in 1968, is on the Forest, with the remainder on Willamette and Deschutes National Forests. Each of the three Forests manage that part of the Wilderness within its boundaries. The following sketches summarize the general characteristics of each of the Forest's Wildernesses.

(1) *Columbia Wilderness*. This is located on the Columbia Gorge and Hood River Ranger Districts about 30 miles east of Portland, and eight miles west of Hood River. A large Wilderness of approximately 39,000 acres, it offers a wide variety of scenic and natural features. On the north

WILDERNESS AND UNROADED AREAS



side, rugged and steep mountainsides exhibit spectacular basalt cliffs, rocky slopes, and rock outcroppings. As the slopes rise, the terrain turns into slightly uneven, broad plateaus. Visitors can wander past talus slopes, waterfalls, lakes, and mountain peaks. The lower and middle parts of the major slopes fall within the western hemlock zone. The upper slopes are within the Pacific silver fir zone. All three main creeks of the Wilderness, Tanner Creek, Eagle Creek, and Herman Creek, flow north to join the Columbia River. Bull Run municipal watershed borders the Wilderness to the southwest.

The Columbia Wilderness records more than 60,000 visitor-days per year, making it the highest used Wilderness on the Forest. Most of its recreation use consists of hiking, viewing the scenery, and backcountry camping. There are approximately 96 miles of trail within the Columbia Wilderness. One of the best known and most heavily-used trails in the Columbia Wilderness is the Pacific Crest National Scenic Trail, which crosses Benson Plateau in the western portion of the Wilderness. Another heavily-used trail is the Eagle Creek Trail which provides access to many popular scenic attractions and camping spots like Punch Bowl Falls, Tunnel Falls, and Wahtum Lake. Two primary access points for entry into the Columbia Wilderness are Interstate 84 in the Columbia Gorge on the north, and Wahtum Lake on the southeast.

(2) *Salmon-Huckleberry Wilderness.* This Wilderness is located on the Zigzag Ranger District about 15 miles southeast of Sandy, and 55 miles southeast of Portland. Slightly larger than the Columbia Wilderness, Salmon-Huckleberry's 44,600 acres are mostly covered with trees. Volcanic plugs, pinnacles, cliffs, and steep and sharply cut slopes make this a rugged area. Most of the lower slopes are within the western hemlock zone with a transition to the Pacific silver fir zone on the upper slopes. The Salmon River and Eagle Creek, with their tributaries, form the two main watersheds of the Salmon Huckleberry Wilderness.

With an estimated total of 11,000 RVDs per year, Salmon-Huckleberry has the lowest recreation use of any Wilderness on the Forest. Its main attraction is the Salmon River National Recreation Trail which offers a variety of scenic attractions including views of waterfalls within the Salmon River Gorge. The trail seems on a level directly paralleling the river, but it is actually located several hundred feet above the river except for the lowest 2 1/2 miles. The remaining recreational use of the area occurs widely over the western part of the Wilderness. This portion contains such trails as Eagle Creek Trail, Wildcat Mountain Trail, and Huckleberry Mountain Trail. Another trail, the Hunchback Mountain Trail, generally follows the north-eastern boundary of the Wilderness. State Highway 26 and Salmon River Road, State Highway 224 and Abbot

Road, and Forest road #2613, which goes through Sherar Burn, provide the main access points to the Wilderness.

(3) *Badger Creek Wilderness.* The 24,000-acre Badger Creek Wilderness lies on the Barlow Ranger District about 45 miles southwest of The Dalles and 67 miles east of Portland. Glacial features such as steep-walled, wide U-shaped valleys contribute to the extensive geological and ecological diversity of this area. The upper portion of the Badger Creek drainage offers the most dramatic features of the Wilderness. Upper reaches of the major watershed fall within the mountain hemlock zone. Eastern areas are in the ponderosa pine zone which includes large areas of Oregon white oak and grasses. This part of the Wilderness is usually warm during the summer. Lookout Mountain is the highest point in the Wilderness, and with the ridge to the east supports a subalpine biological community. A high elevation community of grasses and herbs grows at High Prairie.

Recreation use of this Wilderness averages about 14,000 RVDs per year, making it one of the lightest used areas. Its trails total 45 miles including the Badger Creek National Recreation Trail. The crest of Lookout Mountain provides commanding views of the Cascade Range and the eastern high desert country. Badger Creek Wilderness has three major access points: Forest roads #44 and #4410 via State Highway 35; forest roads #27 and #2710 via U.S. Highway 97; and forest roads #48 and #4811.

(4) *Mt. Hood Wilderness.* Covering 47,100 acres surrounding Mt. Hood, this Wilderness stretches from the Zigzag Ranger District into the Hood River District. It is about 23 miles east of Sandy and 45 miles east of Portland. Its range in elevation is extreme, from 2,000 feet at its lowest point to 11,235 feet at the summit of Mt. Hood, a truly demanding topography. Permanent glaciers cloak the top of Mt. Hood, and glacial-fed streams, high lakes, and alpine meadows acclaimed for their late summer tapestry of bright wildflowers, surround the mountain peak. The variety of elevation and climate has produced equally varied biological communities. Western hemlock zone communities grow in lower elevations, giving way to Pacific Silver fir, mountain hemlock, and subalpine forests as the height increases, finally reaching the alpine zone in the uppermost reaches.

This is a heavily used Wilderness averaging about 56,075 RVDs per year. It contains 112 miles of trails including the Pacific Crest National Scenic Trail traversing the Wilderness. Areas offering special attractions such as Elk Meadows, Ramona Falls, Elk Cove, Paradise Park, and the Timberline Trail have the greatest recreation uses. Various high lakes dotting the foothills of Mt. Hood also attract many visitors. Overuse of some of the most popular areas in recent years has caused some deterioration and brought on more restrictive Wilderness management.

Two primary access points include Forest roads #18 and #50 via U.S. Highway 26, and forest road #3555 and #3512 via State Highway 35. Two land inholdings are located within the Wilderness: a 600-acre parcel owned by Clackamas County, and a 40-acre parcel owned by a private individual.

(5) *Bull of the Woods Wilderness*. This Wilderness is located on the Estacada Ranger District about 68 miles southeast of Portland and 65 miles east of Salem. Of the total 34,900 acres of the Wilderness, 26,400 acres are the responsibility of Mt. Hood National Forest; the remaining 8,500 acres are administered by the Willamette National Forest. Steep, mountainous slopes which make up the Wilderness are deeply cut by a number of streams, including the major headwaters of the Collowash, Breitenbush, and Little North Fork Santiam rivers. Dense stands of giant trees cover most of the slopes. The largest part of the area falls within the western hemlock forest zone. The mid-slope areas fall in the Pacific silver fir forest zone, and the upper ridges in the mountain hemlock forest zone. More than a dozen lakes, covering more than an acre each, isolated from one another by steep, high ridges, are spotted throughout the Wilderness. These lakes support small populations of resident fish.

An estimated 14,700 RVDs consisting primarily of hiking, camping, and fishing are recorded per year within the Bull of the Woods. Most of the recreation occurs along the 35 miles of recreation trails. The Bull of the Woods Lookout is one of the most heavily used areas in the Wilderness because it commands a superb, 360-degree view of the surrounding territory. Mine shafts, old pieces of equipment, and other man-made features are found within the Bull of the Woods; reminders of a once active mining history.

Key access points for the Bull of the Woods Wilderness include Forest roads #46 and #2209 via State Highway 22, and forest roads #63, #6430, #6341, and #70 via State Highway 24.

c. Relationship to the Natural Environment

A central purpose of establishing Wilderness is to preserve the natural environment. The requirements of the Wilderness Act, previously cited, combined with the Pacific Northwest Region's policy of nondegradation of Wilderness, assures conditions in which natural processes are left to function without interference from human beings. This does not mean human activities have been completely eliminated from Wilderness. All Wildernesses receive some recreational use, with concentrated uses in specific locations. Sometimes concentrated use of Wilderness can cause deterioration of the resource. Heavy foot traffic by hikers can compact the soil and trample vegetation. Camping can exaggerate those impacts. High elevation areas are generally less resilient to soil and vegetation disturbances than areas at lower elevations. Areas on the drier east side

of the Cascades are in general less resilient to damage inflicted by human activity than areas on the west side.

Suppressing nature-caused fires also has had, and has, an impact on Wilderness because this management activity can eliminate the role of fire in changing the character of Wilderness vegetation. The evidence of past fires is not always visible, especially on the west side, but most biological communities have evolved following fires from natural origins. Therefore, the continued suppression of fire in Wilderness can cause biological consequences so far not foreseen.

d. Relationship to the Human Environment

In an earlier passage we touched on the subjective, intangible, yet highly satisfying and important benefits people can reap from the preservation of Wilderness. A stay in Wilderness can provide a sense of adventure, of renewed respect for natural beauty, the rarity of complete solitude, and uninterrupted moments of reflection. Many people find that coming together with untrammelled nature, leaving behind all reminders of civilization, can help the spirit to soar. Aside from their subjective, individual benefits, Wilderness also provides opportunities for the study of biological and physical phenomena which otherwise would not be available.

e. Management Concerns

(1) *Estimating Demand*. This is a fundamental management concern which has been complicated by the establishment of four new Wildernesses. Accurate estimates of use of the new Wildernesses have yet to be collected. Therefore the amount, location, and type of Wilderness recreation uses taking place on the Forest is unknown at this time. To solve the estimating problem, Forest management has relied on historical data for some locations, and the professional judgments of local managers. Recreation-use estimates under this process can be used for establishing general trends only. The accompanying table III-38, summarizes the current use of five Wilderness areas projected to show anticipated future demand in relation to estimated Wilderness capacity.

According to the estimates in Table III-39, (which are based on even distribution of use), the Forest falls short of meeting present and future demand, especially in the Mt. Hood and Columbia Wildernesses. However, actual use patterns magnify the problem. Most recreational use of Wilderness occurs at popular destination points or along main access trails, and some resource deterioration occurs at the most heavily used destinations. The problems have identified the need to collect reliable wilderness-use data for each of the areas. The most heavily used wilderness locations are listed in Table III-39.

Table III-38

Wilderness Recreation Demand in RVDs Per Year^{2/}

WILDERNESS	ESTIMATED CARRYING CAPACITY ^{1/}	CURRENT USE	DEMAND BY YEAR 2030
Columbia	29,827	60,600	119,768
Badger Creek	19,155	14,000	27,668
Salmon-Huckleberry	33,697	11,000	21,741
Bull of the Woods	20,530	14,700	29,052
Mt. Hood	35,475	56,075	110,824
Subtotal	138,684	156,375	309,053
Mt. Jefferson ^{3/}	4,948	10,125	20,011
Totals	143,632	166,500	329,064

^{1/} Wilderness carrying capacity based on coefficient of 1.0 RVD/ACRE/YEAR for Semi-Primitive Trailed WROS zone, and 0.75 RVD/ACRE/YEAR for Primitive Trailed WROS zone.

^{2/} 1983 Recreation Information Management (RIM) Estimates, Report No. 2300-1

^{3/} Mt. Hood National Forest portion of use only. Refer to Willamette National Forest for more complete information.

Table III-39

Most Heavily Used Wilderness Destinations

MT. HOOD WILDERNESS	SALMON-HUCKLEBERRY WILDERNESS	COLUMBIA WILDERNESS	BULL OF THE WILDERNESS
Burnt Lake Ramona Falls Eden Park Elk Cove Paradise Park Mt. Hood Summit Elk Meadows Cooper Spur	Rolling Riffle	Wy'East Camp Wahtum Lake 7 1/2 Mile Camp Tunnel Falls Eagle Cr. Trail	Bull of the Wood Lookout Pansy Lake

(2) Current Management Policies. Basic management policies comply with the requirements of the Wilderness Act of 1964 and the nondegradation policy for the management of Wilderness within National Forests established by the Pacific Northwest Region. The general orientation of the Mt. Hood Wilderness is toward regulating specific recreation activities such as camping or building fires. All Wilderness administration on the Forest depends heavily on volunteer Wilderness rangers. Time has not permitted the development of additional management policies for the most recently designated areas (Columbia, Bull of the Woods, Salmon Huckleberry, and Badger Creek).

Under existing policies, timber harvest in Wilderness is prohibited. Geothermal sites can be developed only under strict standards which may make development difficult. Prospecting for minerals in Wilderness areas is permitted but no new patents or claims can be filed. No existing

patented claims are in effect for any of the Forest Wilderness areas.

(3) *Wilderness Recreation Opportunity Spectrum as a Management Concept.* Standards and guidelines for managing Wilderness within the nondegradation policy have been developed under the Wilderness Recreation Opportunity Spectrum (WROS) concept. In the Pacific Northwest Region, the WROS classification system has been adopted to establish a variety of settings to meet Wilderness management objectives. The WROS classification applies specifically to Wilderness management and should not be confused with the Recreation Opportunity Spectrum classification system. WROS classifications are determined by measurable criteria which describe the social, biological, and physical characteristics of the area. Three primary zones are:

(a) Primitive Trailless. This zone offers the maximum possible solitary Wilderness experience. To qualify for this designation, the zone must be large enough to allow at least two days of cross-country travel without crossing a constructed trail. No more than one encounter with another user may be expected. The Forest does not contain this class of Wilderness zone.

(b) Primitive Trailed. This zone offers the most solitary experience to be found on the Forest. The only facilities permitted are those needed to protect the environment. In practice, this means the presence of trails and a limited number of signs only. A user may expect to encounter no more than six other parties per day during 80% of the use season.

(c) Semi-Primitive Trailed. This zone offers somewhat less solitary Wilderness experience than the Primitive Trailed. Activities to control degradation of the ecological and social values of the Wilderness are evident. Limited development, including toilets, are permitted. The number of encounters with other users is not expected to exceed 12 parties per day during 80% of the season.

In addition to the primary zones, the Mt. Hood National Forest has established a Transition Zone. Although this zone totals only 3,991 acres on the Forest, encounters with other users in some areas exceed those specified for the Semi-Primitive Trailed zone making it desirable to identify areas where the heaviest use of the Wilderness takes place. Management control where necessary in a Transition Zone is clearly evident. More signs are in the zone, and trails may be constructed to higher standards. Encounters with other users is expected to be 18 or less per day during 80% of the season.

Table III-40 summarizes the existing WROS classifications by acres for all Wildernesses on the Forest.

Demands of many Wilderness users for access points, facilities, and other development inconsistent with the pur-

pose of establishing Wilderness has created an important management concern. In response to the situation, the Forest intends to use all available means to educate the public on the intent of the Wilderness designation, the use of WROS intensity zones, and the types of recreational activities which may be expected in a Wilderness.

Table III-40

Existing WROS Classification Zones^{1/} In Acres^{2/}

WILDERNESS	TOTAL ACRES	PRIMITIVE TRAIL-LESS	PRIMITIVE TRAILED	SEMI-PRIMITIVE TRAILED	TRANSITION
Columbia	38,885	0	36,233	1,615	1,037
Badger Jordan	24,295	0	20,560	3,735	0
Salmon-Huckleberry	44,600	0	44,555	211	70
Bull of the Woods	26,385	0	23,422	1,581	1,382
Mt. Hood	47,100	0	43,072	1,669	1,502
Mt. Jefferson	4,948	0	0	4,948	0
Totals	186,213 Acres	0 Acres	167,842 Acres	13,759 Acres	3,991 Acres

^{1/}WROS classification guided by Forest Service Manual 2320-1 Region 6 Supplement 56. Classification is based on the degree of solitude, the amount of Forest Service administration, the type of trail system available, and the anticipated camping experience.

^{2/}1984 Data.

9. Unroaded Areas

a. Background

In January 1979, approximately 221,800 acres in 11 separate areas were identified as RARE II Roadless areas. RARE II was a comprehensive process instituted in June 1977 to identify unroaded and undeveloped land areas in the National Forest System, and to determine their general uses for both Wilderness and other resource management and development. The process was completed in 1979.

The Roaring River area and the Larch area were unroaded but not listed as RARE II Roadless areas. The reason is that both areas had a previous unit planning process completed and were therefore not considered part of the RARE II process.

In passing the Oregon Wilderness Act of 1984, Congress created new Wildernesses out of five of the RARE II Roadless Areas. In each case, the Wilderness formed was less than the area of the unroaded area. Table III-41 shows the RARE II Roadless area, the Wilderness formed, and the unroaded acres remaining.

Table III-41

Roadless Areas, Wilderness, and Remaining Acres

RARE II ROADLESS AREA	WILDERNESS FORMED	REMAINING ACRES
Badger	Badger Creek	1,700
Bull of the Woods	Bull of the Woods	11,400
Eagle	Columbia	16,800
Mt. Jefferson Additions	Mt. Jefferson	300
Salmon-Huckleberry	Salmon-Huckleberry	20,300

b. Existing Situation

After the passage of the Oregon Wilderness Act of 1984, 10 areas large enough to be managed for unroaded values remained unallocated to Wilderness. They comprise about 130,000 acres. The following changes in these areas should be noted: (1) Mt. Jefferson Additions, RARE II area 0601, had 900 of its 1,200 acres added to Mt. Jefferson Wilderness. The 300 acres remaining were incorporated into the Olallie unroaded area. Table III-42 shows 8,100 acres in the Olallie/Mt. Jefferson area. These have been treated in the analysis as part of the RARE II Olallie Further Planning Area.

The 1984 Wilderness Act stated that except for lands remaining in further planning status, such as the Rare II Olallie Further Planning Area, lands cannot be managed as wilderness during this planning cycle. The Rare II Olallie Further Planning Area has been evaluated for a range of management objectives, which includes wilderness. The other areas determined to have unroaded values have been evaluated for a range of management alternatives in this document.

A number of small, fragmented pieces of unroaded land are unsuitable for unroaded management. However, many of them are suitable for other uses, and these were incorporated into other land allocations.

Complete descriptions and histories of each of the 10 remaining unroaded areas may be found in Appendix C. The environmental consequences of allocating these areas to the various other land allocations, as detailed in Chapter II, are also taken up in detail in Appendix C. Listings of unroaded areas and their acreages are listed by Ranger District in Table III-42. A map of the Forest's unroaded areas is provided earlier in this chapter (in the section on Wilderness).

Table III-42

Unroaded Areas by Ranger Districts

UNROADED AREA NAME	LOCATION BY RANGER DISTRICT	PRESENT SIZE IN ACRES
A- Eagle	Columbia Gorge	16,800
B- Larch Mountain	Columbia Gorge	13,900
C- Roaring River	Estacada	29,600
D- Olallie/Mt. Jefferson	Clackamas	8,100
E- Wind Creek	Zig Zag	5,700
F- Twin Lakes	Bear Springs	6,500
G- Bull of the Woods	Estacada	11,400
H- Mt. Hood Additions	Hood River and Zig Zag	16,000
I- Salmon-Huckleberry	Estacada and Zig Zag	20,300
J- Badger	Barlow	1,700
TOTAL AREAS: 10		
TOTAL ACRES REMAINING:		130,000

Until the Forest Plan is completed and remaining unroaded areas are allocated to specific uses, these areas are being managed under the current District Multiple Use Plans and the Forest Timber Management Plan. These plans allow timber harvesting in most of the existing unroaded areas.

c. Relationship of Unroaded Areas To The Natural Environment

An area kept in its natural, unroaded state maintains vegetation, wildlife, soil, hydrologic, and atmospheric conditions provided it is not subjected to some large scale disturbance like a catastrophic fire, windstorm, insect attacks, or outbreak of disease.

Any evidence of man's influence and activities tend to diminish over time provided management activities are kept out of the area. Educational opportunities for the study of ecological processes also increase over time. However, insects or disease infestations can gradually spread to adjacent lands unless these are controlled. An indirect effect of keeping an area in a natural state is a buildup of natural fuels and reduced vigor of timber over time. This increases the risk and severity of fires, and attacks by insects and disease.

In the long term, unroaded areas tend to benefit wildlife species that require natural habitats. However, such areas may or may not reduce available habitat for species associated with early-stage vegetation, depending on the character of the area. Habitats of threatened and endangered species, or sensitive species, would be protected by unroaded lands. Unroaded areas capable of producing old growth would benefit wildlife species dependent on old growth.

Timber harvesting activities and associated road building, and to a lesser extent the motorized recreation that accompanies road construction, can adversely affect wildlife habitat and wildlife use patterns. As unroaded areas are developed, hiding cover and thermal cover are reduced along with accompanying reductions in habitat for species

associated with old growth. Increases in forage favor species that require younger stages of vegetative cover. Harassment of wildlife species may increase as roads are built into unroaded areas.

d. Relationship of Unroaded Areas To The Human Community

The issue of unroaded areas and their eventual fate has been one of great public concern. The passage of the Oregon Wilderness Act of 1984 settled the question for some of the formerly unroaded areas. The Forest Plan will designate the others for a number of possible uses.

Opinions on the use of unroaded areas vary from having all of them available for timber harvest or other types of developed resource management, to having all of them maintained for unroaded recreation. Whatever choices may be made, there will be gains and losses. Timber is a valuable commodity, and its harvest provides needed employment. Unroaded areas are a valuable resource, and opportunities to explore the back country provide needed solace to the spirit. The remaining unroaded areas can provide a range of opportunities for recreation use and are a benefit to various species of wildlife and flora.

The existing unroaded areas provide opportunities for semi-primitive and primitive dispersed recreational experiences. These areas also provide opportunities to reduce the number of people using Wilderness by dispersing people into the unroaded areas, thus reducing the impacts on heavily used Wildernesses.

The management of Unroaded Areas under prescriptions that do not retain unroaded characteristics has an associated loss of semi-primitive and primitive dispersed recreation opportunities. This loss usually leads to recreation activities based on motorized vehicles. In addition the opportunity for future generations to manage areas as Wilderness, or in the natural state, would be lost or reduced due to developing unroaded areas for timber harvest.

As unroaded areas are developed, management activities change the visual appearance of the areas during both short and long terms. Forest visitors begin to experience a change in the Forest's structure and appearance from the existing condition of natural stands consisting of larger trees of mixed ages to a more uniform, managed forest with smaller trees and less dead and down material.

10. Special Interest Areas

a. Background

The purpose of designating sites on the Forest as Special Interest Areas is to assure that places with special or unique values maintain their management direction between successive administrative officials. Special Interest design-

nations also inform the public that continuity of management is assured.

The management objective for Special Interest Areas is to keep them substantially in their natural condition. They should be operated principally for recreational uses, although certain other uses may be authorized at the discretion of the officer making the classification. Area boundaries should be easily recognized, readily enforced, and include all values to be protected. Special Interest Areas of less than 100,000 acres may be approved by the Regional Forester, although areas larger than 5,000 acres are reviewed by the Chief of the Forest Service. This classification is authorized by 36 CFR 294.1., and the Areas are managed under regulations in this section of the Code of Federal Regulations.

Fifteen new Special Interest Areas have been considered for addition to five areas currently designated as Special Interest Areas. The list of proposed Special Interest Areas was developed by request to the District Rangers. They were asked to suggest areas and to provide maps showing locations and boundaries. Other proposed areas were taken from Unit Plan EIS's, including public input, suggestions from the Management Team Representatives group, and National Register properties that include substantial land bases. In addition, proposed, but never officially designated, Special Interest Areas were taken from old Recreation Area plans.

b. Existing Situation

(1) *Barlow Tollgate*. This small area less than a one acre (.8 acres) is located on Highway 26 in the Zigzag Ranger District. It includes an interpretive site, a tollgate reconstructed to duplicate the one originally erected on the Barlow Road, and two maple trees which stood on the site when the tollgate was used from 1879 to 1915. The Barlow Road was opened to emigrant travel in 1846.

(2) *Columbia Gorge Old Wagon Road*. This 65-acre area in the Hood River Ranger District includes part of the original Dalles-Sandy wagon road built by Oregon in the 1870's. A section of the road has a rock retaining wall with several rock ovens along the talus slope of Shellrock Mountain.

(3) *Little Crater Lake*. This 4.6-acre site is a geological wonder, Located 16 miles south of Mt. Hood, It is about 80 feet in diameter with sheer, vertical walls descending to a depth of some 45 feet. The lake is circular and resembles a crater, but its origin is due to a fault structure. The fault acts as a passageway for water so clear visitors can see far down into the lake. The deep blue color of the lake, its setting inside a meadow, and the adjacent campground provide a variety of recreational and interpretive opportunities.

(4) *Olallie Lake*. This 10,800-acre site is located in high country at the south end of the Forest. Glaciation of the location created more than 200 lakes and ponds including Olallie Lake, largest in the area. Several campgrounds and a resort area are available. A guard station built in the 1930's by the Civilian Conservation Corps is still used by the Forest Service. The Olallie lakeshore and a number of points in the unroaded hiking areas of the backcountry provide striking views of Mt. Jefferson.

(5) *Oneonta Gorge*. This 11.5 acre narrow canyon is located in the Columbia Gorge. Oneonta Creek flows through the 75 to 175 feet high basalt cliffs of the this canyon. Oneonta Falls dominates the head of the canyon. The small gorge contains fossils and casts of remains of an ancient forest buried eons ago by basalt flows. It is one of the most diverse habitats for rock dwelling plants in the Columbia Gorge; more than 100 species currently grow there.

These five existing Special Interest Areas occupy approximately 10,800 acres.

c. Proposed Special Interest Areas

(1) *Face of the Columbia Gorge*. This is a large area of 23,000 acres which can be seen from highways along the Columbia River in both Oregon and Washington. Spectacular waterfalls, majestic columnar basalt cliffs, and a virtual panorama of vegetation are among the special scenic features of this proposed site. The southern wall of the gorge is especially scenic.

On October 15, 1986 Congress established the Columbia Gorge National Scenic Area (P.L.-99-663). The Face of Columbia Gorge proposed Special Interest Area lies within the boundaries of this newly established National Scenic Area. The recently created Columbia Gorge National Scenic Area includes lands within and adjacent to both the Mt.Hood and Gifford Pinchot National Forests. Pending development of the Scenic Area Management Plan by the Commission established by this legislation, the boundaries and/or management of the area within the proposed Face of the Columbia Gorge Special Interest Area may change, however based on current management, 23 million board feet of timber could be produced from the Scenic Area per decade. Plans for the National Scenic Area will not be included in the Forest Plans presently being prepared for each Forest. When completed, these Forest Plans may be amended or revised to include all or portions of plans for the National Scenic Area if the Regional Forester determines that such changes are desirable. All plans for the National Scenic Area will be included in the Forest Plans at the time of their first scheduled revision in 10-15 years.

(2) *Barlow Road*. This road of historic interest traverses 6,420 acres of the Barlow, Bear Springs, and Zigzag Ranger Districts. The travel route was first opened to

emigrant travel in 1846. The proposed acreage includes the visual foreground along the road (visual viewshed). A recognized segment of the famous Oregon Trail, it is now part of the Oregon National Historic Trail designated by Congress in 1978. Features of special interest are the routes followed by the early settlers, and the historic sites along those routes.

(3) *Larch Mountain*. A 40-acre site on the Columbia Gorge Ranger District, this proposed area offers visitors a day-use picnic area, and a magnificent view of the surrounding countryside from a scenic outlook at Sherrard Point, an andesite dike. Visible from the site are the Bull Run drainage area, Mt. Hood, and the surrounding volcanic peaks of the Cascade Range, including Mt. Rainier.

(4) *Roaring River*. The area totals 22,700 acres in a stretch of the Roaring River canyon on the Estacada Ranger District. The area includes a spectacular narrow gorge lined with sheer basalt cliffs and talus slopes that widen upstream to an undisturbed river valley with timber sweeping up the steep slopes. It is unroaded and provides hikers with a choice of several trails. A further indication of its character is that Roaring River is under consideration as a Wild and Scenic River.

(5) *Mitchell Flats*. An area of 1,152 acres located on the Clackamas Ranger District, this proposed site offers numerous hiking and cross-country ski trails, and has both scenic landscapes and wildlife viewing opportunities.

(6) *Lost Lake*. This area of 3,700 acres is justly famous for its view of Mt. Hood, and includes Lost Lake and the surrounding basin. The campground, resort, and picnic area on the east shore are privately operated at this time under a special permit. The area is at the west end of the Hood Ranger District.

(7) *Bagby Hot Springs*. This 363-acre site is located near the Hot Springs Fork of the Clackamas River, 40 miles south of Estacada. The proposed area includes the access trail and the spring development which consists of cedar tubs, log dugouts, a bath house, and a cabin. A ranger station built in the 1910's is now used as a storage cabin. The Friends of Bagby, a private group, has maintained the site. Special features of this area include the thermal hydrogeology, microhabitat for plants, historical buildings, and the unique recreational opportunities of the hot springs.

(8) *Sugar Pine*. This 40-acre site contains a unique stand of a few scattered old growth sugar pines and is the northernmost growth of this tree species. The pines are isolated from the remainder of their range which is from southern Clackamas County to Baja California. This botanical area is located in the southern section of the Clackamas Ranger District.

(9) *Little Crater Lake Expansion*. This 300-acre proposed area includes a campground and a meadow adjacent to the previously designated Little Crater Lake Special Interest Area. The meadow offers wildlife observation and various types of recreation including interpretation of the local ecology. Its high-elevation meadows, among the few on the Forest, are ecologically sensitive. The area is on the Bear Springs Ranger District.

(10) *Squaw Meadows*. This 734-acre proposed area is an impressive example of a cirque basin created by a glacial scour. Other special features include ecologically sensitive, high-elevation meadows needed by some species of wildlife. Archeological and historical sites are also present within the areas boundaries. It is located at the north edge of the Roaring River drainage on the Estacada Ranger District.

(11) *Parkdale Lava Beds*. These lava beds of 875 acres within the Hood River Valley resulted from a relatively recent (approximately 250 years ago) vesicular basalt inter-canyon lava flow. The beds are an excellent example of an "aa" type lava flow typified by rough, jagged, spinose, and cindery surfaces. Large deposits of stream and lake sediments indicate the Middle Fork of the Hood River was probably dammed by the lava, for the river has now cut a channel along the western edge of the flow. Vegetation throughout the area varies from extremely brushy with small conifers on the south end to extensive areas with no vegetation on the north end of the flow. The area offers a range of recreational and interpretive opportunities.

(12) *Olallie Lake Expansion*. This proposed addition would add 1,700 acres to the Olallie Lake Special Interest Area by expanding its northern boundary. On the south end of the Forest, it includes a part of the Pacific Crest Trail, a small lake and surrounding meadow, and some interesting geological features.

(13) *Clackamas Lake*. This area of 240 acres, located on the Bear Springs Ranger District, includes the former Clackamas Lake Ranger Station with its CCC-era architecture, the Miller cabin site, and meadow/forest transition vegetation. The Ranger Station is outstanding in its exterior and interior architectural integrity to the construction style used by the Civilian Conservation Corps in the 1930's. The area was listed on the National Register in 1979.

(14) *Cloud Cap - Tilly Jane*. This 1,075-acre area on the Hood River Ranger District contains sites and features from a bygone recreational era, the period of early uses that began in 1885 and ended in the late 1930's. This was the time when recreation such as mountain climbing took place on the northern slopes instead of today's more popular southern slopes. The area includes three roads up the north side of Mt. Hood into the area from below Cooper Spur, Cloud Cap Inn,* Cooper's tent campsite, the

Inn's stable site, the Snow Shoe Club's cabin, two old cabin sites, a CCC camp, Tilly Jane Forest Camp, Tilly Jane Guard Station, an American Legion camp and amphitheater, and the CCC Ski Warming Hut. It was listed on the National Register in 1979.

(15) Mill Creek Buttes. This area of 1,150 acres includes the twin peaks of Mill Creek Buttes and is situated in the City of the Dalles Municipal Watershed on the east side of the Barlow Ranger District. With elevations ranging from 4,000 to almost 5,000 feet, the buttes overlook surrounding forested valleys to provide panoramic views.

The proposed Special Interest Areas total approximately 64,000 acres. The accompanying map shows the locations of existing as well as proposed Special Interest Areas.

d. Relationship to the Natural Environment

An area designated as a Special Interest Area must be managed by the Forest to retain substantially its natural condition. The special designation generally will emphasize old-growth forests and wildlife species dependent on old growth. The development of other resources will not be allowed to materially impact the special or unique features which justified the area's special designation, such as unique or unusual scenic, historical, archeological, geological, botanical, zoological, paleontological, or comparable characteristics.

e. Relationship to the Human Environment

Special Interest Areas offer a wide variety of recreational opportunities to visitors, from unroaded trail hiking to developed resorts. These areas must therefore be managed to satisfy the recreational needs of a cross-section of people, although a limited number of other uses may be permitted. Depending on the special features of the area, dispersed or developed recreation is likely to be the main focus, and increased recreation opportunities would result. On the other hand, the public may actually be restricted in the use of parts of designated areas to protect their special features. Such restrictions could prohibit downhill ski development and building new campgrounds. Areas of concentrated recreation use, loading ramps, stock tanks, fences, and holding pens should be located away from the special features of the area. If range conflicts with the observation of wildlife, wildlife will prevail. Improvements which should increase public enjoyment of the environment by increasing opportunities for wildlife observation may be initiated.

f. Management Concerns

The goal of Forest management of Special Interest Areas is to protect and, where appropriate, foster public use and enjoyment of important historic, cultural, and natural components of our national heritage. Public use of these areas for recreation, study, and pleasure is restricted only by the

need to protect their special features. A management plan for each area will provide direction for specific protection measures, acceptable development and enhancement programs, and other appropriate uses and activities. Since these areas are by definition special or unique, individual management programs conforming to Special Interest Area standards and guidelines must be developed for each one. Management plans for existing Special Interest Areas must be updated to reflect current management concerns and new opportunities which may develop under the Forest Plan.

The impact of Special Interest Area designations on other resources of the Forest is a matter of significant management concern. Timber harvesting, for example, would be prohibited in these areas except for salvage or disease-control programs needed to protect special features. Road and facility development would probably be restricted to areas in which developed recreation uses already exist. Some existing roads and facilities may be closed or removed if they impair the areas' special features. On the other hand, new roads and facilities may be needed to improve access to the special features of an area. The trail systems in these areas may be expanded or improved. Also, structural and non-structural habitat improvements are permissible provided they will not detract from the special features of the area, or cause extended disruption of recreation use. If possible, native or natural appearing materials should be used.

Management of fire suppression will be limited to methods which least impact the special features and landscape of designated areas. If natural fire has been an important factor in the past ecology, natural fires may be allowed to burn when safe and otherwise practicable. Fuel loads may need to be reduced near improvements and facilities to reduce the risks of fire damage.

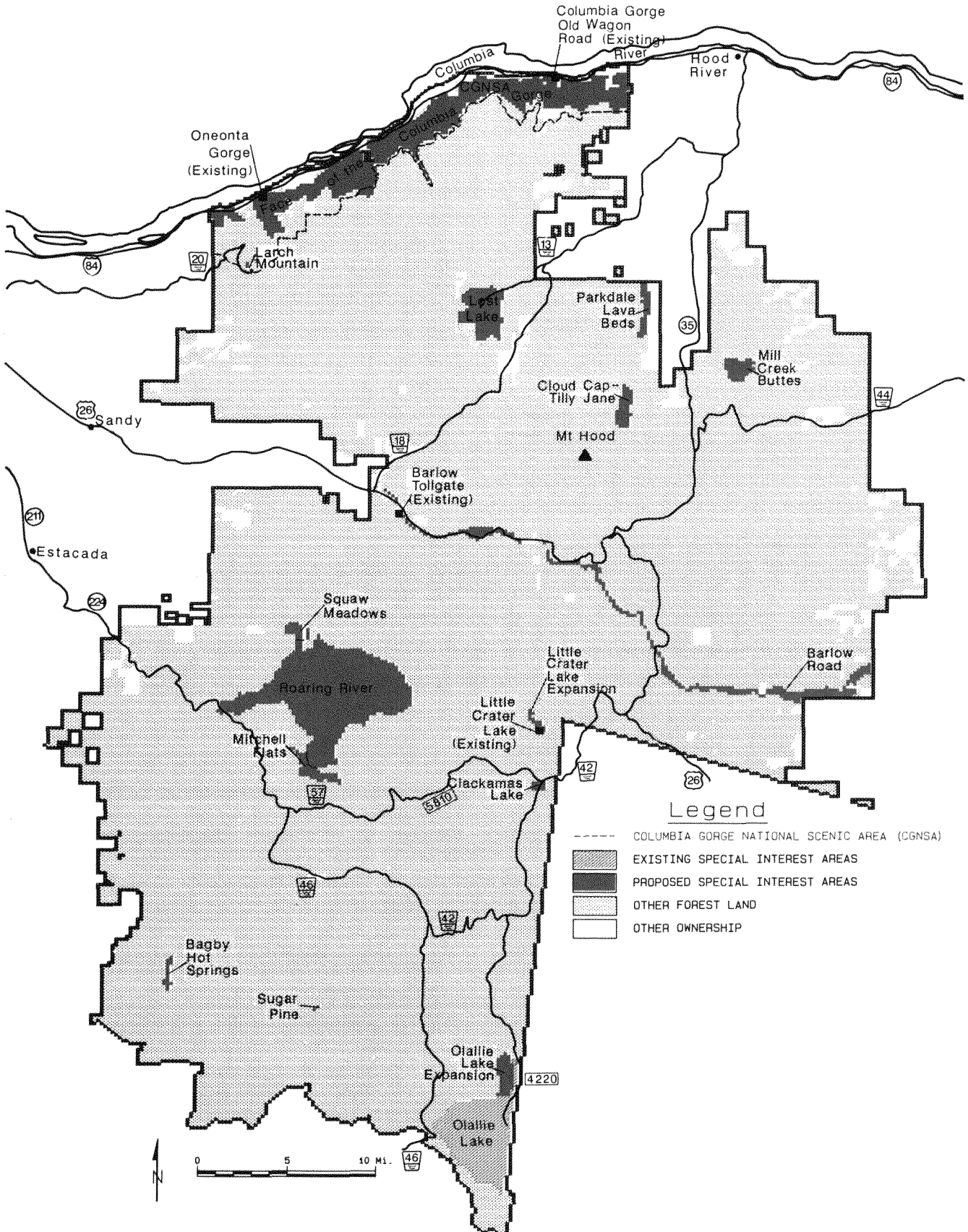
Uses which impair the special features of a Special Interest Area or cause long term disruption of recreation use may be prohibited. Therefore, these areas may be withdrawn from mineral entry and mining laws, but not from mineral leasing laws. Hydroelectric development affecting stream flow will be strongly discouraged because the free flow of rivers and streams is an important element of natural environments.

11. Visual Resources Management

a. Background

The Forest provides the public with recreational benefits as well as products like wood and water. One benefit enjoyed by perhaps the largest number of people is beautiful scenery. With more than a million acres in the heart of the Cascade Mountains, the Forest daily offers a number of magnificent scenic vistas, a snowcapped mountain, spectacular waterfalls, crystal streams, blue lakes, and

SPECIAL INTEREST AREAS



meadows of many-colored flowers. Visual resources like these attract not only nearby residents but also tourists from other parts of the nation.



Mt. Hood

What is beautiful and desirable in a landscape is, of course, a purely personal judgment. A view some may find breathtaking could be boring to others. However, landscape architects have been able to identify recurring qualities in scenes most people consider attractive. After allowing for differences in tastes, they have developed a system of classifying landscapes according to their desirability. The system is called the Visual Management System, or VMS, and is used in the Forest's visual resource management. In VMS --

Variety is an attractive mixture of features like landforms, waterforms, rock formations, and/or patterns of vegetation. This concept is used in establishing three classes of variety. Variety Class A would be landscapes of unusual or outstanding variations as opposed to Variety Class C landscapes tending toward monotony.

Sensitivity Level is a particular degree or measure of viewer interest in the scenic characteristics of the landscape.

Distance Zones are areas of landscapes determined by specific distances from the observer. These zones are used as a frame of reference in which to discuss landscape characteristics or human activities.

Visual Quality Levels are the output of the VMS inventory process, and are based on physical and social characteristics (Variety Class and Sensitivity Levels) of the Forest. Each level refers to the degree of acceptable alteration from its natural condition. When Visual Quality Levels are adopted by management through the planning process, they become Visual Quality Objectives.

(1) Preservation: limited to ecological changes.

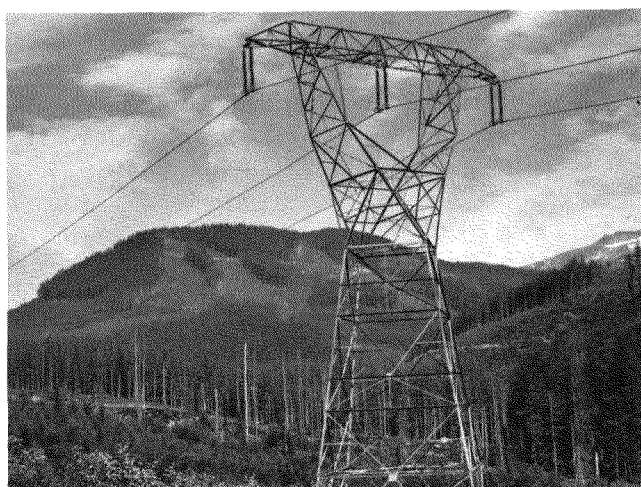
(2) Retention: retain a predominantly natural landscape with human activities not evident to casual visitors.

(3) Partial retention: evidence of human activities permissible but subordinate to characteristics of the natural landscape.

(4) Modification: although human activities may dominate the landscape, their evidence must blend with the landscape's natural characteristics. Human modifications should appear as natural occurrences when viewed closely or from a moderate distance.

(5) Maximum modification: although human activities may dominate the landscape, they must still appear as natural occurrences when viewed from long distances.

(6) Unacceptable modification: occurs when activities do not blend with the landform when seen from any distance, and are visually unrelated to natural occurrences in scale and shape. Because this condition is less than acceptable alteration, it is not one of the visual-quality objectives.



Unacceptable modification.

b. Existing Situation

In 1973, the visual quality of the Forest was inventoried using the Visual Management System just described. This inventory was updated in 1983. The following tables show

Table III-43

Variety Class Inventory

CLASS	DEFINITION	ACRES	PERCENT
A	Unique or outstanding	272,500	25
B	Common to the character type but not outstanding	659,900	60
C	Minimal variety	168,300	15
TOTALS		1,100,700	100%

the results of these inventories according to variety, sensitivity level, distance zones, and visual condition.

Table III-44

LEVEL	DEFINITION	ACRES	PERCENT
1	Highest sensitivity	533,800	48
2	Average sensitivity	218,000	20
3	Lowest sensitivity	348,900	32
TOTALS		1,110,700	100%

These sensitivity levels, listed above, identifying a different level of concern for scenic values, were used in the visual resource inventories because people are not equally concerned about the scenic quality of all areas of the Forest. Areas seen from well-travelled roads or places with high public use have higher sensitivity.

The closer an observer is to the landscape, the more critical are its characteristics. The zones in the next table are from an observer on a well-travelled route, or at a popular recreation site. Foreground, middleground, and background categories of the inventory include only sensitivity levels 1 and 2.

Table III-45

Visual Distance Zones (Sensitivity Levels I & 2)

ZONE	DEFINITION	ACRES	PERCENT
Foreground	Within 1/4 to 1/2 mile of observer	110,600	10
Middleground	From foreground to 3-5 miles from observer	403,400	37
Background	From middleground to infinity	46,700	4
TOTALS		560,700	60%

The existing visual condition of the Forest, as depicted in Table III-46, was recorded in 1979. These conditions are a measure of the degree of human-caused alteration that was

Table III-46

Existing Visual Condition

VISUAL CONDITION	ACRES	PERCENT
Preservation	297,600	27
Retention	556,600	50
Partial Retention	66,100	6
Modification	84,900	8
Maximum Modification	81,800	7
Unacceptable Modification	13,700	2
TOTALS	1,100,700	100%

then evident. Although expressed in the same terms as the Visual Quality Levels, they are different. EVC measures what is on the ground, whereas VQL shows what it should be in the future.

The amount of human alteration of the landscapes, as presented in Table III-45, was determined from an assumed middleground distance.

c. Relationship to the Natural Environment

Human beings have altered the landscapes of the Pacific Northwest from prehistoric times. No matter how natural the Forest's environment may seem at this time, it is the result of past events, both natural and human. Yet visitors to the Forest desire naturally appearing landscapes. This means, in general, minimum obvious alterations by people. Exceptions occur. A Class C landscape with its monotonous, minimum variety can be modified to increase the variety of its vegetation. A landslide, windstorm, or wildfire may be natural, but they can also modify landscapes to an unpleasant status. It would be a mistake to rule out all modifications which could reduce the risks or damage of natural catastrophes.

Forest visitors are in general pleased with landscapes compatible with wildlife habitats. Stands of old growth, meadows, and riparian areas are usually found attractive. However, habitats based on snags or large downed materials are less appealing. As a general rule, diversity providing the most desirable landscapes also provides the best wildlife habitats.

Natural landscapes featuring bodies of clear, clean water and banks lined with vegetation attract not only human visitors, but also resident and anadromous fish.

Visual resource management with regard to fire is a mixed problem. Fire is a naturally occurring event in the ecosystem. In the short run, it usually destroys what pleases the eye in the natural environment. In the long run, however, the landscape heals, and the beauty of the area may in time be increased due to increased diversity of vegetation.

d. Relationship to the Human Environment

People have expressed considerable concern about the visual quality of the Forest. The sheer beauty of the Forest is clearly a significant part of the region's human environment. Many people favor an environment in natural condition to the point they resist changes to a managed landscape even if the changes are gradual. Other people appear satisfied with a managed landscape provided it blends with the natural surroundings. One certainty is that the Forest's natural beauty will continue as a high priority as the use of the Forest increases in proportion with nearby population increases. The demand of recreational visitors for scenic vistas has generated a resulting need to manage the landscape for visual quality.

The demand for visual quality can have an intensive impact on timber harvesting, a subject to be discussed as a management concern. The same may be said for the construction of roads and utility corridors, and developed recreational facilities.

e. Management Concerns

For about 20 years after the end of World War II, few people paid particular attention to the effects of Forest management on scenic quality. More recently, attempts have been made to retain the integrity of the landscape while managing for timber harvesting and the use of other resources. As these efforts proceeded, the future visual character of the Forest was expressed in the form of recommended visual-quality levels. Present management programs are aimed at achieving the following visual-quality levels based on the updated visual-resource inventory.

Table III-47

Recommended Visual-quality Levels

VISUAL QUALITY LEVELS	ACRES	PERCENT OF FOREST'S GROSS ACRES
Preservation (mostly wilderness)	191,000	17
Retention	118,000	11
Partial Retention	273,800	25
Modification	418,900	38
Maximum Modification	99,000	9
TOTALS	1,110,700	100%

The Forest has been divided into viewsheds based on the Sensitivity Levels, the existing visual conditions, and the recommended visual quality levels discussed in this section. These viewsheds can be managed under different management schemes to achieve different Visual Quality Objectives. Managing different combinations of viewsheds for given Visual Quality Objectives can provide Forest visitors with various scenery patterns along sensitive travel routes and from sensitive viewpoints.

The analysis of effects on visual quality is presented in terms of these viewsheds in Chapter IV. The map accompanying this discussion depicts the boundaries of the viewsheds on the Forest. The level of the viewshed is in reference to whether or not the viewshed can be seen from a high traffic volume travel route with Level I (Primary) viewsheds being the most important viewsheds from this standpoint.

The impact of visual-resource management on timber harvesting, road building, and facilities development is a major management concern. Visual-resource management normally reduces the amount of timber to be cut according to scheduled timber harvests. The cut allowed for a particular sale may have to be reduced if it would adversely impact an area managed for visual quality. Costs increase

for logging operators, as well as Forest management, in areas managed for visual quality. Roads and power lines may be re-designed, or relocated to avoid detractions from the natural landscape. In some situations, road building may be precluded altogether. New or expanded recreational sites must be evaluated with visual impact in mind. Ski runs, in particular, could mar the view of a hillside. However, expansion and new developments may be undertaken when care is exercised to blend them into the natural surroundings.

Since vegetation normally grows back, a heavily altered landscape should eventually heal and, in the absence of further modification, once again become visually appealing.

12. Cultural Resource Management

a. Background

Cultural resources are artifacts, buildings, or sites left from human activity in a past era. Examples could be a mining district with old towns and relics of past human activities, an abandoned trading post, tools, cooking utensils, or caves or other types of dwellings. Cultural resources may have archeological, historical, or architectural values, and are unique in being irreplaceable. If any of these elements of our national heritage are destroyed, they are gone forever. Faced with the increasing loss of these treasures, Congress acted to protect them by passing such laws as the Antiquities Act of 1906; the National Historic Preservation Act in 1966, amended in 1980; Executive Order 11593; and, very importantly, the American Indian Religious Freedom Act at 1978, and the Archeological Resources Protection Act of 1979.

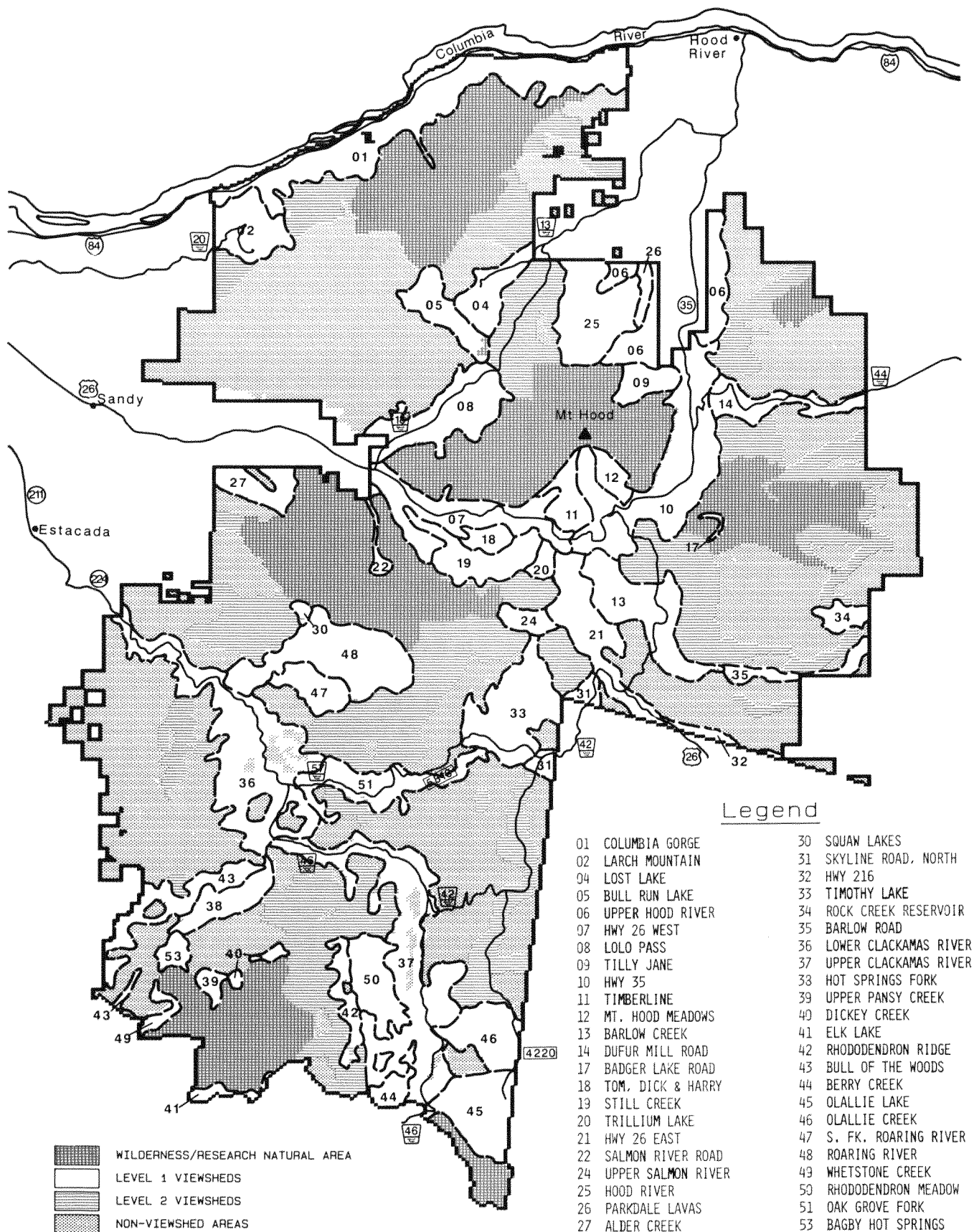
b. Existing Situation

At least 900 known cultural resources are located on the Forest. They include Native American and Euro-American resources ranging from 8,000-year old archeological sites to structures built in this century. Native American groups using areas on the Forest include the Clackamas, Cascades, Hood River Wasco, Tenino, Molalla, and Paiutes affiliated with the Northwest Coast, Columbia Plateau, and Great Basin Culture Areas. Cultural resources left by groups represent a common culture consisting of shared language, social customs, subsistence methods, material goods, tools, religious practices, and world view.

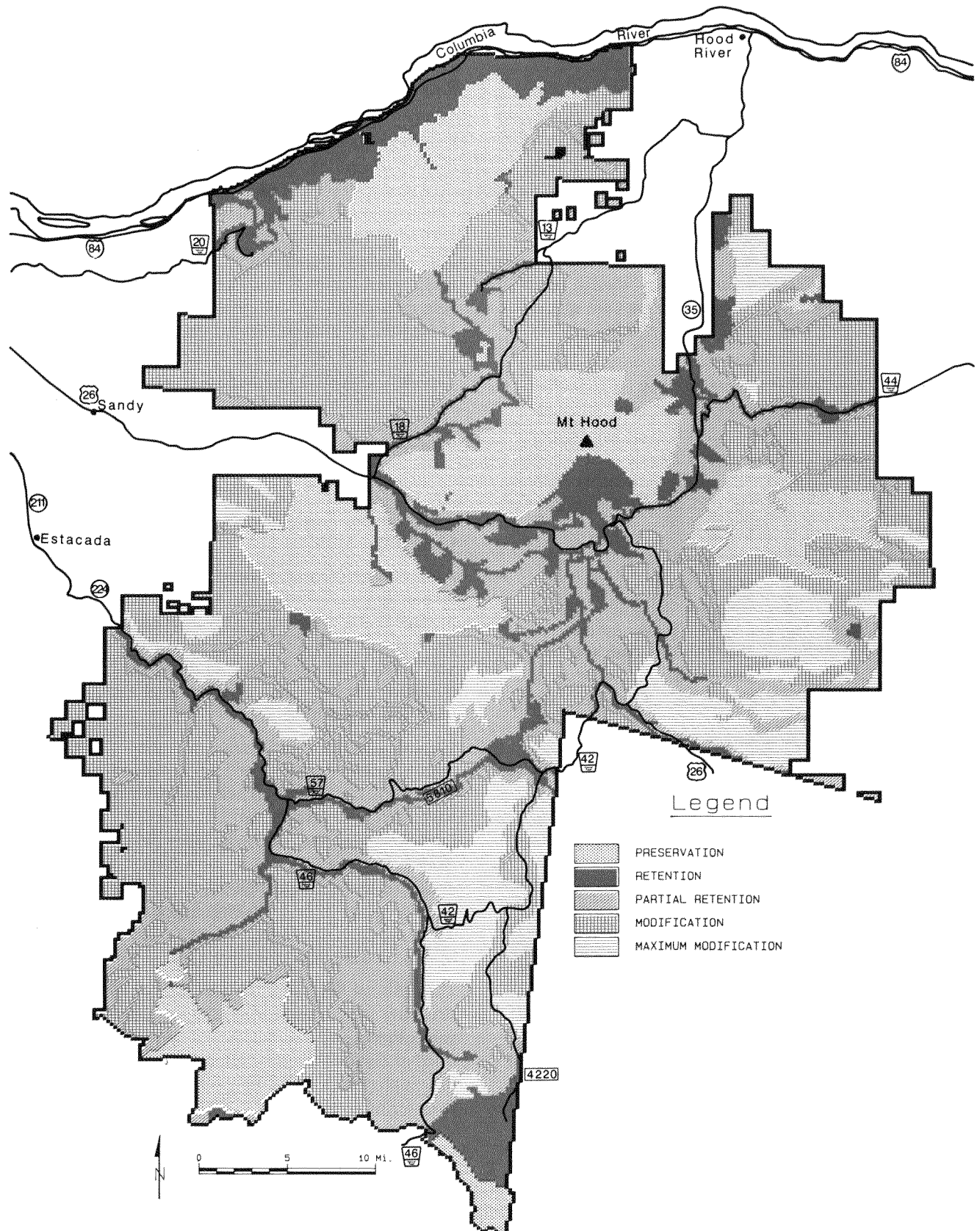
Available evidence indicates that Native American use of what is now the Forest was transitory. They hunted, gathered roots and berries, fished, and held religious ceremonies. Various sites contain evidence of their activities, such as an assemblage of stone tools and waste found in an area possibly used by a family as a seasonal campsite. Materials of this type, called lithic scatters, are usually small and located at higher elevations, although

Map TWO-2

SCENIC VIEWSHEDS



INVENTORIED VISUAL QUALITY OBJECTIVES



several large sites of more than 20 acres have been discovered along major water courses. Scattered tools or abandoned campsites may indicate the route of an old Indian trail. Stands of cedar trees stripped of bark suggest these peoples made bark baskets for carrying food. Clusters of rock cairns may be remains left by Indians seeking their guardian spirit on a vision quest. Trails cut through the Forest were frequently used by Native Americans previous to Euro-American settlement, and many of them have become today's roads and trails.

Immigration of settlers from the east drastically changed Native American ways of life in the last century. In 1855, representatives of the Warm Springs tribes signed a treaty relinquishing approximately 10 million acres of land to the U.S. Government. This treaty reserved the present-day Warm Springs Reservation for them, and after 1879 several Paiute bands moved to the Reservation. Native Americans continue to use the Forest today, though much less so than in the past. Most present day uses are gathering berries, gathering roots, and conducting religious ceremonies.

As Euro-Americans settled the region, they looked at the Forest as an obstacle to get through or around, not an area with productive resources. The Barlow Road was opened in 1846 as an alternative route for settlers on their way to the Willamette Valley instead of rafting their belongings down the Columbia River. This road was finally replaced by the Mt. Hood Loop Highway in 1925.

By the late 1800's, Euro-Americans began to find the Forest of value for both timber and recreation. The first developed site was on the northeast flank of Mt. Hood, where Cloud Cap Inn was built in 1889. During the 1920's, recreation activities shifted to the south side of Mt. Hood around Government Camp, culminating with the completion of Timberline Lodge in 1938. Other recreation sites with a history of long, continuous use are Bagby Hot Springs dating from 1881, Eagle Creek Campground dating from 1916, and Multnomah Falls Lodge dating from 1925.



Bagby Guard Station.

Logging began on the edges of the Forest in the 1880's. Areas logged included the eastern creek drainages, the Larch Mountain area, the LaDee Flat area, and the West Fork of the Hood River. Timber harvesting on any worthwhile scale did not move to the rest of the Forest until after World War II. Major cultural resources representing other uses are the Mill Creek Community, dated in the mid-1800's, the Bull Run Waterworks, completed in 1893, and the Three Lynx-Oak Grove Hydroelectric Project in 1924.

The U.S. Government has administered the area now known as Mt. Hood National Forest since 1893. In 1907, the Department of Agriculture began managing the Cascade Forest Reserve. In 1908, boundaries close to the Forest's present boundaries were set for the Oregon National Forest, renamed the Mt. Hood National Forest in 1924. Through the years, the Forest Service has built ranger stations, guard stations, lookouts, and a system of trails to help manage the 1.1 million acres within the Forest. During the great depression of the 1930's, the Civilian Conservation Corps built or expanded the Zigzag, Parkdale, Columbia Gorge, Oak Grove, and Clackamas Lake Ranger Stations which represent the last major expansion of facilities. Additional details about the Forest's cultural resources may be found in the *Cultural Resources Overview of the Mt. Hood National Forest* (Bryant, Con-ton, Hurlbett, and Nelson, 1978); also the *Cultural Resources Overview: Clackamas and Badger Jordan Planning Units* (Ellis, 1979).

An inventory of cultural resources on 194,983 acres, about 20% of the total Forest area, was completed in 1984. If an average of 45,000 acres are inventoried each year, approximately 75% of the Forest will be inventoried by the year 2000. If the current rate of discovery continues, it is estimated that more than 2,000 cultural resources will have been discovered by then.

The full significance and value of a cultural resource requires field investigation and a complete report of its characteristics. Of 150 known Native American sites, 81 have been field investigated and recorded. Of 750 known Euro-American sites, 257 have been field investigated and recorded. Of the 338 sites so far recorded, 60 have been evaluated to determine their eligibility for listing on the National Register of Historic Places. Forty-three of sixty sites have been determined eligible. Sites found ineligible have been designated for other uses.

The National Register of Historic Places lists sites and structures which have local, state, or national historical value. Places with national historical significance are identified as National Historic Landmarks. At the present time, eleven properties on the Forest are listed on the National Register of Historic Places:

- Timberline Lodge

- Zig Zag Ranger Station
- Cloud Cap Inn
- Parkdale Ranger Station
- Clackamas Lake Ranger Station
- Cascade Work Center
- Cloud Cap-Tilly Jane Recreation Area
- Columbia River Scenic Highway
- Multnomah Falls Lodge
- Eagle Creek Campground, overlook and picnic area
- Silcox Hut.

Timberline Lodge is also a National Historic Landmark as representative of "depression era" work done by artists under a government program. Two more properties were nominated for listing in 1986: Oak Grove Work Center and the Olallie Lake Guard Station. Barlow Road, including its associated sites, has been designated a segment of the Oregon National Historic Trail. All standing structures listed on the National Register, or those determined eligible for listing, are actively maintained. Historic structures are maintained by permittees under the Special Use Permit Program in compliance with the Secretary of Interior's Guidelines for Historic Rehabilitation.

c. Relationship to the Natural Environment

Protecting a cultural site can often protect other environmental values, and vice versa. For example, cultural resources are often found in riparian areas so that protecting these areas and fish habitats can help to protect cultural resources in them. Protecting animal species dependent on old growth can contribute to the protection of cultural resources in old-growth areas. Managing Forest resources to minimize the risks of natural disasters such as earth slides and fires can reduce the risk of destroying cultural resources.

d. Relationship to the Human Environment

The benefits of cultural resources to the American public are both tangible and intangible. Tangible benefits include the attraction of such findings for visitors, especially if a good interpretive program has been developed. Intangibly, cultural resources can help communities to feel increased respect for their heritage, to feel the continuity that exists between past and present, and even to feel better about themselves. In one sense, significant cultural resources may be beyond price.

e. Management concerns

Laws and regulations require the inventory and management of cultural resources to assure that project managers give full consideration to their protection. Forest Service regulations for the Pacific Northwest Region require an ap-

proved management plan for National Register and other historic structures under permit.

Cultural resources can provide an experience for Forest visitors that is both recreational and educational. The attraction of historical sites is illustrated by the great number of people who visit Timberline Lodge. The popularity of the interpretive program of this site, and the interest of Oregonians in the history and protection of the Barlow Road, documented by correspondence on file at the Forest, suggest the need for comparable programs at other sites.

The recreational use of the Forest increases the need to protect its cultural resources, which people can damage through ignorance or malice. The potential for damage increases in proportion to its increased use by the public. Another potential for damage is the construction of small scale recreation projects in areas which could easily contain cultural resources. The amount of damage done to cultural resources to date is not known, but the cumulative effect could be high. On the other hand, cultural resources, especially when supported by interpretive programs, have untold potential for enhancing recreational opportunities. Historical roads and trails, especially the Barlow Road, illustrate how these resources could be used to develop new facilities for recreation and at the same time help to disperse hikers.

Timber harvesting can be a threat to cultural resources although current policy is to avoid disturbing them when practicable. Thick vegetation can hide cultural resources and they can be destroyed before anyone knows it. Sites exposed by timber harvesting can expose them to vandalism and illegal collecting. Road building associated with timber harvesting adds to this threat by increasing the accessibility of areas. Flat ground favored by road builders has a high probability of containing cultural resources with resulting risk of their destruction. The risks are particularly high during bridge building or reconstruction. The magnitude of this problem is shown by the discovery and recording of a great proportion of the Forest's sites during the planning of timber projects.

In some areas, the presence of cultural resources determined as significant and covered by the management objective of preservation in place may prohibit most methods of timber harvest leaving full-suspension and helicopter yarding as the only acceptable procedure. Such constraints, and the mitigation of timber-harvesting impacts through data recovery of significant sites, will undoubtedly increase costs of timber-harvesting programs. A potential benefit, however, is that timber harvesting and road building removes obscuring vegetation, increases ground visibility, and provides quicker access to remote areas for surveyors. This increases opportunities for discovering sites and reduces the costs of conducting surveys.

Other threats to cultural resources are geothermal exploration and construction of small hydroelectrical sites. Stream-side areas are prime locations for cultural resource sites, and the probabilities of their presence in those areas could delay the project or increase its costs due to site mitigation.

Range use also requires steps to assure cultural resource protection. Animal trampling in ranges can break fragile cultural remains. Range burning to renew grasses and forbes can destroy historic structures and damage prehistoric stone tools if the burn is not controlled.

A side benefit of erosion control is that it generally will protect prehistoric sites hidden in the soil mantle. Activities that lessen the impact on soil usually result in less impact on cultural sites. Ground-disturbing activities would not take place in sites managed for in-place preservation.

The major goal of the existing cultural resource program is to preserve significant sites and materials for scientific study and public use and enjoyment. A major concern is therefore to locate cultural resources with a minimum expenditure of public money. As required by the National Historic Preservation Act, the Forest conducts a survey for cultural resources when a land exchange or ground-disturbing project comes under consideration.

During project activities, areas with a high probability of containing a cultural resource are surveyed again on a priority basis. This is not yet a standard practice. Funding at this time is limited to surveys which support the planning of resource management projects. If this restriction continues, approximately 25% of the Forest may never be inventoried because project money is not available for wilderness areas, special interest areas, research natural areas, developed recreational sites, and unroaded areas. These areas often may be radically different environmentally from the rest of the Forest, and without data from them knowledge of the cultural resource data base can never be complete.

Lack of funding has also made it impracticable to monitor the condition of sites not directly connected to funded projects. Therefore the impact on cultural resources due to vandalism, illicit collecting, natural deterioration, or destruction from any other cause remains unknown.

Executive Order 11593 and the National Historic Preservation Act require the Forest to protect known cultural resources until their significance has been professionally evaluated. There is a backlog of sites which have not been investigated in the field or professionally evaluated. Based on evaluations completed so far, it is possible that as many as 30% of the recorded sites are being protected needlessly. Nevertheless, policy at this time is to avoid known cultural resources whenever practicable, and pending evaluation all recorded cultural resources are being protected to

prevent unintentional destruction, alteration, or transfer from federal ownership.

When cultural resources are discovered on a project area, the potential impact of the project on the resources must be evaluated. The findings of the evaluation are sent to the State Historic Preservation Office for consultation and to obtain that Office's concurrence. If the project may affect a cultural resource, the Forest obtains the comments of the Advisory Council on Historic Preservation. Comments from the agencies are given full consideration before the project is initiated. If necessary, Forest management will direct design modifications of the project to avoid or mitigate undesirable impacts on cultural resources.

The need for a long-term strategy to discover and protect cultural resources is a special management concern. No such strategy exists at this time. Timberline Lodge and the Clackamas Lake Ranger Station operate under the required management plans, but management plans for other National Register properties are not currently being prepared. Building maintenance in the past preserved the cultural qualities of the structures, and maintenance today remains sensitive to their historic values. However, preservation treatment, maintenance, rehabilitation, and priorities for the long term have yet to be identified, much less implemented.

Historic structures which can be used for non-administrative purposes are now maintained by permittees under Special Use Permits. In compliance with federal laws and regulations, the Forest, the State Historic Preservation Office, and the Advisory Council on Historic Preservation review the proposed work projects of permittees. So far, only the history of the Barlow Road, two prehistoric sites, and properties nominated to the National Register have been studied in depth.

Another management concern is the lack of programs for managing resources traditionally used by Native Americans under the terms of the American Indian Religious Freedom Act. In compliance with the Act, the Forest provides free access to sites, use and possession of sacred objects, and freedom of worship through ceremonial and traditional rites. Native Americans are free to gather huckleberries and other plants on the Forest as they desire.

Requiring the Forest to protect its cultural resources can seriously impact fire management activities. On one hand, fires remove obscuring vegetation and make surveys for cultural resources easier. On the other hand, cultural resource preservation may require low intensity fires, hand-piling slash, relocating fire lines, or the total elimination of a prescribed burn.

A last management concern with regard to cultural resources is the lack of interpretive programs to increase public awareness and enjoyment of them. Some well-known resources have enhancement programs. Visitors can see a

slide-tape program on the prehistory and history of the Clackamas River area at the Estacada Ranger District. A slide-tape program on the Barlow Road is available at the Zigzag Ranger District. Timberline Lodge has a number of interpretive programs including movies and guided tours. Abbot Road, Cloud Cap Inn, and sites along the Barlow Road have interpretive signs. Tollgate Campground has a reconstructed tollgate of the Barlow Road. However, on-site enhancement is lacking at more than 60 sites where themes could be developed including transportation, recreation, lumbering, the Depression Era, energy, fisheries and the Forest Service. Archeological sites which do not lend themselves to on-site enhancement could be interpreted through slide-tape programs, brochures, and scientific publications.

13. Indian Concerns

a. Background

Native Americans inhabited the Pacific Northwest long before Europeans explored it. They hunted, fished, gathered plant foods, and held religious ceremonies on the lands which are now the Forest. In the 1800's, however, settlers emigrating from the east severely disrupted their way of life. In 1855, tribal representatives hoped to resolve their problems by signing a treaty relinquishing approximately ten million acres of land to the U.S. government. Today's Warm Springs Reservation was set aside for the Wasco and Walla Walla (Warm Springs) tribes, which were joined on the reservation by several Paiute bands after 1879. This took place after the Malheur Reservation for the Paiutes reverted to public domain when the Paiutes left the reservation to fight the U.S. Army.

In 1937, the three tribes adopted a constitution and by-laws for tribal government and became organized as the Confederated Tribes of the Warm Springs Reservation. The tribal government now manages timber, water, salmon, and other reservation resources for the benefit of its members. The Tribes own and operate the Kah-Nee-Ta resort.

Beginning in 1877, a strip of land known as the McQuinn strip became the source of litigation between the Tribes and the Federal government. A 1972 court case settled the dispute by transferring 61,000 acres of Forest land to the Confederated Tribes. During a period lasting from 1948 to the final settlement, the area in dispute was managed jointly. After the settlement, the Forest Service continued to administer the two campgrounds and the Pacific Crest National Scenic Trail under the McQuinn Act, subject to joint approval of management plans by the Tribes and the Forest Service. The Bureau of Indian Affairs provides funds for maintenance and operation.

The location of the Warm Springs Indian Reservation adjacent to the southeastern boundary of the Forest creates mutual concerns. The Native Americans have vital inter-

ests in the management of the Forest. The Forest has comparable interests in the land uses of the reservation. Native Americans who are not members of the Confederated Tribes also take special interest in the Forest's resources. Members of tribes with treaty rights to fish for salmon in the Columbia River are understandably concerned with activities which may affect supplies of anadromous fish.

b. Existing Situation

Leaders of the Confederated Tribes cooperated with Forest management on the development of the Warm Springs Comprehensive Land Use Plan which was adopted in 1983. Under this plan, most reservation lands adjacent to the Forest were designated to remain forested. Roads, transmission lines, old mill sites, ranger stations, lookouts, and recreation sites are the only developments permitted. Timber management and harvest is the primary use. Secondary, compatible uses include maintaining fish and wildlife habitats, gathering traditional foods, and grazing livestock. Any uses that would reduce the land base for timber production are considered not compatible. Housing on these lands does not exist.

Tribal members are presumed to be the main users of recreation lands on the Forest adjacent to the Olallie Lakes area. Recreational pursuits which preserve the natural and scenic characteristics of the area are primary uses. Secondary, compatible uses are maintaining fish and wildlife habitats, and gathering traditional foods. Most types of development and intensive resource uses are excluded as not compatible.

To the south of the Olallie Lakes area on the reservation lies a Wilderness, a land designation of great importance to many tribal members. The area is adjacent to the Mt. Jefferson Wilderness found partly on the Mt. Hood National Forest and partly on the Deschutes National Forest. East of this area are lands used as range for grazing livestock. Roads, powerlines, fences, and scattered rural housing are the main land modifications.

Traditional foods. Native Americans rely on the Forest for traditional food and craft products needed for their cultural practices. Huckleberries gathered and eaten during ceremonies, feasting, and celebrations are one of the most important uses of these foods. The Forest does not contain traditional huckleberry fields as found on some other National Forests in the region, and in recent years huckleberries have grown more scarce as trees have replaced huckleberry areas.

c. Relationship to the Natural Environment

Traditional foods eaten by Native Americans come from plants growing wild on the Forest. As shown in the accompanying table, plants for crafts, as well as foods grow in every Forest habitat from marshes to dry or rocky sites.

Table III-48

Habitats of Plants Commonly Gathered by Native Americans

RIPARIAN AREAS	WEST SIDE FORESTED	EAST SIDE FORESTED	DRY SITES	ROCKY SITES
Willow Tulle Cattail Wild celery	Huckleberry Blackberry Strawberry Bear grass Redcedar	Chokecherry Black moss Bear grass Camas Strawberry Onion Huckleberry	Biscuit root Balsam root Wild carrot	Bitter root Wild onion Strawberry

Wild-growing huckleberries, a resource of high priority to Native Americans, must have sunlight to grow. In the natural environment, fire or other natural disasters would create sunny clearings where the berries could thrive. In years past, Native Americans often deliberately created such openings to promote huckleberry growth. More recent Forest Service management of lands for timber has encouraged the growth of trees, and as a result huckleberry plants have diminished. The best time for huckleberry growth is after a fire or logging operations, and following the first growth of grasses and herbs. As soon as trees grow large enough to shade the area, huckleberry plants will lose vigor and die.

Native Americans hunt deer and elk which do best where there is a combination of forest for cover and open areas for the growth of grasses and herbs. The most important fish to Native Americans is salmon, and these must have cool, clean water for reproduction and early growth. Riparian areas must be protected for salmon to remain available.

d. Relationship to the Human Environment

For many Native Americans, practicing their traditional customs may be among the most important qualities in their lives. Some would say the opportunity to gather the foods and materials they need is beyond price. Their traditions and continuation of their heritage are for the most part maintained by older members of the tribes; however, some of the younger generations are beginning to exhibit renewed interest in their cultural inheritance. The Forest will continue cooperating with the Tribes enabling them to continue their traditions.

The need for abundant huckleberries and timber production can contradict each other. Intensive silvicultural methods, such as planting and removing brush, and encouraging the rapid growth of trees, discourage the growth of huckleberry bushes. However, timber harvesting favors the growth of the bushes, and allowing for natural succession would permit huckleberries to grow on logged areas. If the Forest were to arrange the planting of huckleberry seedlings after timber harvests, the plants could assure a supply of berries

for perhaps ten years, until the young trees grow large enough to shade out the bushes.

Road building associated with logging could provide easier access to high elevations where huckleberries are most abundant. Roaded access to such areas would be very helpful to older Native Americans. Past fire suppression practices have reduced the acreage with abundant supplies of huckleberries, but fire could also help to increase supplies by keeping openings clear of trees and prolonging berry production.

e. Management Concerns

A main concern is continuation of land uses designated in the Comprehensive Land Use Plan of the Warm Springs Reservation, and the compatibility of Forest land management adjacent to the reservation. Present designations of Forest and reservation lands will assure future compatibility: lands designated for timber production on the Forest and on the reservation are adjacent; lands designated for recreation on the Forest and the reservation are adjacent; lands designated as wilderness on the reservation are adjacent to the Mt. Jefferson Wilderness Area.

The question of whether any Forest lands should be designated for the management of huckleberries could become a subject of concern. No lands at present are so designated. Areas with abundant huckleberries may change from year to year depending on the quality and quantity of berries.

Another area of major management concern is to assure continued cooperation and coordination between the Confederated Tribes and the Forest. Both parties work closely on the management of fisheries habitats on streams originating on the Forest and flowing into the Warm Springs Reservation. Both agencies also coordinate land use management and the gathering of traditional plant foods.

14. Land Ownership

a. Background

Three documents provide the basis for adjusting the ownership of Forest lands. The Mt. Hood Community Plan is a Clackamas County planning document intended as a land-use plan for the area's community. It was developed in coordination with the Forest and the Bureau of Land Management. The second document, the Government Camp Community Design Study prepared by Clackamas County for the Forest, has different objectives. This study suggests methods of coordinating the development of private and public lands and identifies land parcels which might be exchanged between the Forest and the County for mutual benefit. The third document, the Mt. Hood National Forest Ownership Adjustment Plan, applies Forest-wide. A more detailed examination of this plan follows the discussion of the existing land ownership situation.

b. Existing Situation

Of the 1.1 million acres making up the Forest, less than four percent is owned privately or by non-Forest agencies. Longview Fiber and Mountain Fir Lumber Company own most of the privately held land on the east side. Publishers Paper Company owns land on the west side. Portland owns land along the Bull Run River. A number of private individuals own smaller parcels along Highway 26, also called the Mt. Hood Corridor. Some intermingled ownership exists in the Columbia Gorge.

The Columbia Gorge is one of the most critical areas involving land ownership adjustments. Private ownership of numerous parcels along the Gorge tends to conflict with the exceptional scenic qualities of the Gorge. An equally critical area is the Mt. Hood Corridor where seasonal and permanent residential use of the area is increasing rapidly. This development creates increasing needs of support services and community facilities like domestic water, waste and sewage disposal systems, schools, medical care, and police and fire protection.

Areas available for further development now have population densities approaching urban/suburban communities. The density is likely to increase because the amount of corridor land in private hands is relatively small. As the area becomes more heavily populated, demands for the residential use of surrounding Forest lands are almost certain to increase. Such requests have already been received. The situation requires a policy that identifies the conditions under which public land might be made available for private purposes.

c. Relationship to the Natural Environment

Land is often acquired by the Forest to conserve fish and wildlife habitats, or to protect environmentally sensitive areas. For example, a transaction is in process to acquire land on the East Fork of the Hood River for fish habitat.

d. Relationship to the Human Environment

Land, and its ownership, is obviously a critical element of the Forest's human environment. To maintain or improve that environment, the Forest from time to time conducts land ownership adjustments, usually through land exchange. For example, land exchanges between the Forest and private land owners can improve timber-management programs. This is particularly true of exchanges which consolidate ownership and eliminate the costs of surveying boundaries and negotiating rights-of-way prior to a timber sale. If, on the other hand, forested land is exchanged for land to be designated as a recreation or wildlife habitat, the land available for timber is correspondingly reduced. A timber sale can also halt a land adjustment transaction if it occurs prior to the transaction's completion.

People who enjoy recreation and viewing the Forest's scenery benefit from land exchanges made to improve visual quality. This type of acquisition often occurs in response to special designations by Congress. The Columbia Gorge is an example of an area where land is being acquired through Land and Water Conservation Fund appropriations for recreational and scenic purposes.

As a general rule, people who seek the benefits of the resource involved in an exchange of land gain the most from the transaction. Exchanges are not free of controversy, however. Some transactions can change the tax base of a community. Some transactions are simply to prevent private use of land considered detrimental to a public resource. Some groups may want a specific parcel to be kept private; others may want it owned by the Forest.

e. Management Concerns

The impact of private land ownership on and near the Forest is a major source of concern. The need for land adjustments in the near future, especially in critical areas, is almost certain to intensify. Owners of private parcels continue to approach the Forest to arrange land exchanges.

The guiding management principles derive from the previously mentioned Mt. Hood National Forest Ownership Adjustment Plan. This plan designates five land ownership groups. Each group defines a basis for retaining federal land or acquiring non-federal land. The accompanying table describes these groups, and how the Forest treats lands in each of the groups.

Table III-49

Land Ownership Groups

GROUP	DEFINITION AND DIRECTION
Group I	These lands are those to be used for a specific Congressionally designated purpose. The designation from Congress may be direct or indirect. Examples of these lands are Wilderness Areas or National Recreation Areas.
Group II	These are lands which are critical for managing the resources of the forest. Examples are fish and wildlife habitat or critical areas subject to soil damage. Lands in the Columbia Gorge fall into this group.
Group III	These are lands to be acquired or exchanged in order to consolidate the forest. If intermingled lands are exchanged, administration by both the Forest and the other land owner becomes easier.
Group IV	These are isolated parcels of Forest lands located outside the Forest boundary to be used as trading stock for land acquisition elsewhere.
Group V	These are lands in areas which require more study. On this Forest these areas are the Government Camp area, the Zigzag-Rhododendron area and the vicinity of the Bull Run Reserve.

In table III-50, the total number of acres in each group as stated in the Ownership Adjustment Plan is given, as well as the number of acres that were planned for acquisition and disposal. Since the Ownership Adjustment Plan was prepared, 2,068 acres have been acquired.

Table III-50

Land Ownership Planning

	TOTAL ACRES	ACRES TO ACQUIRE	ACRES TO DISPOSE
Group I	50,738 ^{1/}	640	N/A
Group II	153,135 ^{2/}	1,645	N/A
Group III	855,465 ^{2/}	9,212.57	0
Group IV	39,098	N/A	7,706
Group V	13,045	N/A	N/A
TOTAL ACRES	1,108,481	11,497	7,710

^{1/}Includes 38,500 acres in the Columbia Gorge Composite Area.

^{2/}Includes 220 acres outside the National Forest boundary.

Since the Ownership Adjustment Plan was prepared, 2068 acres have been acquired.

Table III-51

Land Acquired Under the Plan

LAND GROUP	LOCATION	ACRES ACQUIRED	ACRES TO ACQUIRE
II	Columbia Gorge	982	663
II	Hood River Valley	1037	8,176

15. Special Use Permits

a. Background

Residents of the Portland-Vancouver metropolitan area have for many years looked upon the nearby Forest as the place for leisure time activities. Many people also use the Forest for a number of special purposes. When someone applies for a permit for a special use, the Forest normally issues it if the proposed use is (a) compatible with the Forest's management activities, and (b) the Ranger District has enough money to administer the permit.

b. Existing Situation

As the accompanying table shows, the existing (1984) special use permits can be divided into nine main categories.

Due to the proximity of the Forest to a large metropolitan area, plus its nearness to a number of smaller communities, public demands for special uses on the Forest will undoubtedly continue as people explore new opportunities, and the nearby population increases. Uses may change as time goes by, but the number of special use permits, including the total length of right-of-way miles, and the total acres of the permit area, are likely to remain at current levels. The fact is that although the Forest constantly issues new permits, or reissues old ones, the total number issued over the past decade has not changed to any marked degree.

Table III-52

Special Use Permits

CATEGORY OF USE	NUMBER OF PERMITS
Recreation	617
Recreation residences	550
Organization camps	12
Major downhill ski areas	3
Small downhill ski areas	2
Other Type Permits	50
Agriculture	12
Community	5
Industrial	194
Public Information	10
Research Study and Training	53
Transportation	60
Utilities and Communication	62
Water	89
TOTAL SPECIAL USE PERMITS ISSUED	1102 Permits
TOTAL MILES RIGHTS-OF-WAY	3378 Miles
TOTAL ACRES UNDER PERMITS	32,697 Acres

c. Relationship to the Natural Environment

The impact of special uses of Forest resources on the natural environment depends upon the nature of the activity. To cite an obvious example, a one day ski race has far less impact than the development of a downhill ski facility. The basic rule is that the more urban the nature of the activity and the more people it involves, the greater the environmental impact. At this time, the number of acres involved in special uses is minor when compared to the total size of the Forest.

Certain types of new special use permits could have significant impact upon natural systems. Requests to construct small hydroelectric plants, or to start geothermal and gas operations, would cause immediate concern about their effects upon the Forest's environment. Utility and transportation corridors have the most impact on natural systems and other uses of the Forest, and therefore these will be taken up in more detail in following paragraphs.

d. Relationship to the Human Environment

The Forest can often solve the needs of individuals or groups by issuing a special use permit, but in so doing would prevent the use of the involved land by the people at large. Land allocated to many types of special uses cannot be managed for any other use. Moreover, special use permits can divert land to a private operation rather than retain it for Forest management programs like timber production, recreation, or wildlife.

(1) *Urban Support Services.* The increased urbanization of areas near the Forest have led to requests for the construction of urban service facilities, such as sewage treatment plants, on Forest lands. The impact of such development

on the human environment is obvious, and therefore any such proposed use is subject to an environmental analysis and must meet county citing and building codes. No policy on responding to requests for community service uses is in effect at this time, except that private land for the proposed use must be unavailable, and the permit must result in benefits to the government.

(2) *Summer Residence Permits.* Within the last 10 years, the policy on summer home permits has changed from annual issuance to term issuance. Under the present policy, permits last from five to twenty years and could be renewed by the permittee at the end of the term. If the Forest does not intend to renew the permit, notice is issued ten years prior to the expiration date. Present policy also limits the number of summer homes on the Forest to those currently available, and no new summer home lots are available. A few annual summer home permits are still in effect, but most of these are next to Highway 26 which may be widened by the state within the next few years.

e. Management Concerns

Although presently issued special use permits seem to have had little or no unfavorable impact upon the Forest's resources, a matter of concern previously stated is the potential impact of certain types of special uses. These specifically include hydroelectric, geothermal, and oil and gas developments.

Special concerns have been expressed about the possible impact on the Forest's environment resulting from transmission lines and other utility corridors. At present, the Forest has more than 3,000 acres of powerline rights-of-way, three major highway systems (Highways 26, 34, and I-84), plus a number of smaller transmission and utility corridors.

Since other sources of energy and electricity could be developed on the Forest, the impacts of utilities and transportation systems on other resources need to be minimized. Over the near term, no new major powerline corridors on the Forest appear to be necessary. Therefore there is no need to identify potential utility and transportation corridors. However, the demand on existing corridors could increase. Proponents of small hydroelectric projects have tried to locate their developments close to major powerlines to reduce their transmission costs. Such demands could require the construction of short connector systems and the need to widen existing powerlines. Under present and future management policies, the Forest plans to continue looking for opportunities to encourage the use of existing utility corridors.

16. Other Agency Management and Plans

The Forest has reviewed the plans of other agencies with regard to mutual interests and concerns. These plans

describe many relationships between the Forest and local communities, and respond to various human concerns described in other sections of this chapter. The remainder of this section is devoted to a review of five comprehensive plans.

a. Multnomah County

The Multnomah County plan, adopted in 1977, was modified in 1983. This plan calls for intergovernmental cooperation with all agencies. It specifically states, as a policy, that it would attempt to maintain the integrity of the Multnomah plan if actions of an adjacent jurisdiction could have off-site impacts which affect the plan. Part of the plan calls for the encouragement of economic development including industries which process natural resources. At the same time, it provides for the management of growth and minimizing the conflicts between urban and natural-resource uses.

Of four classes of natural-resource lands categorized in the plan, the two which most concern the Forest are Commercial Forest and Multiple Use Forest. County policy allows forest management and compatible uses on commercial forest lands. Forest areas designated for multiple uses are similar to Commercial Forest Lands except that non-forestry uses such as agriculture or cottage industries are permitted if these uses are compatible with lands adjacent to the Forest.

The plan designates areas of Significant Environmental Concern including three which directly or indirectly affect the Forest: The Columbia Gorge, the Sandy Scenic River, and parts of Mt. Hood National Forest. The policy established by the plan is to protect all such areas.

b. Clackamas County

The Comprehensive Plan for Clackamas County was last updated in 1980. Except for the community of Mt. Hood, most of the County land in the vicinity of the Forest has been designated as a forest resource. This designation identifies existing and potential commercial forestry lands suitable for such uses, as well as lands needed for watershed and habitat protection.

This comprehensive plan directs the County to apply zoning districts to the Forest consistent with the Forest's land-allocation and management plans. A County policy established in the plan is for this jurisdiction to support visual management techniques of federal lands within the county. The County declared several roads to be scenic, but this designation does not conflict with the Forest's Visual Resource Inventory.

Land-use issues between the County and the Forest focus on the Mt. Hood Community, a series of settlements and villages on the west flank of the mountain. Private land extends along Highway 26 and well up the side of the moun-

tain to include several areas of private land completely surrounded by Forest lands. In 1982, Clackamas County developed a land use plan placing special emphasis on this community and providing a framework for development. It establishes some controls for the placement of the most intense development and allows for an increase in the population and urbanization of the Mt. Hood Community.

c. Hood River County

This County's Comprehensive Land Use Plan was last updated in 1984. Most of the lands in the County adjacent to the Forest, and nearly all of them on the Forest, were designated Primary Forest. The goal of the plan is to encourage the management of forest commercial lands and to conserve them.

Two areas on or adjacent to the Forest were given special designations. The Parkdale Lava Beds were designated a Natural Area. The face of the Columbia Gorge was zoned Scenic Protection, and the talus slopes and streams were designated as Environmental Protection.

Statements in this County's plan which demonstrate interest in the management of the Forest include:

- (1) A list of scenic roads. Most of these agree with the Forest's scenic inventory. The Old State Highway is not on the scenic inventory.
- (2) A statement supporting the Forest's management plans for Cloud Cap Inn-Tilly Jane Recreation areas.
- (3) A statement supporting the protection of the Mt. Hood Wilderness Area.
- (4) A statement supporting the placement of the Barlow Road on the list of Historic Places.
- (5) A statement saying the Forest "should cooperate with the county in the development of the Oregon Trail System."

d. Wasco County

Wasco County's Comprehensive Land Use Plan was adopted in 1982 and amended in 1984. By far the greatest amount of land in the County, either on the Forest or adjacent to it, was designated as forestry. Lands designated as forestry are publicly and privately owned commercial forest land having a productivity greater than 20 cubic feet of wood per year. The purpose of the designation is to provide for all uses compatible with sustained yield.

This plan identifies several areas as deserving special attention, including a number identified as outstanding scenic areas. One of these, the White River within the River Canyon, is located on the Forest. Portions of this river have been inventoried as a wild and scenic river. Two historical sites on the Forest, the Barlow Road and the Old White River Station Camp, were identified in the county plan.

Part of the plan is a comprehensive plan for the Dalles Municipal Watershed, which is an area of special concern to the Forest, the City of The Dalles, and Wasco County. Under the plan, uses of the watershed which do not conflict with the primary objective of protecting the soil and water resources may be permitted.

Some areas of Wasco County near the Forest have been zoned to permit subdivision, and suburban development has taken place in these locations.

e. The Confederated Tribes of the Warm Springs Reservation

Leaders of the Warm Springs Reservation expressed the interests of Native Americans on the reservation in a comprehensive plan completed in 1983. The contents of this plan were reviewed in a preceding section on Indian concerns.

17. Law Enforcement Program

a. Background

As a general consideration, crime has become an increasingly serious problem on the Forest. The minimum requirements of Forest law enforcement activities are to compel the observance of nearly 200 federal laws and regulations written to protect the Forest's visitors and resources, and to make sure that the government's interests are protected in the event of a claim for damage.

b. Existing Situation

The Forest lies within a drive of one or two hours from metropolitan Portland. The large population of this urban area, like nearly all comparable areas of the far west, has grown significantly. Urban problems, including unlawful activities, have grown along with the population. As the number of metropolitan Portland visitors to the Forest increased, they brought with them an increasing amount of law violations. Criminal acts such as marijuana growing, drug dealing, kidnap, rape, and even murder are among the most serious problems. Illegal cutting of merchantable logs, green trees, wildlife snags, and timber theft are property crimes. Thieves also steal Forest and logging company property, and frequently break into parked vehicles, especially at trailheads. Less serious but aggravating crimes include disturbances at campgrounds, violations of road closures, dumping garbage, and vandalism.

In 1981, the Forest organized an ad hoc group of its personnel to investigate forest-wide problems of law enforcement, but so far no valid data exist to reveal any trends in law violations. Categories of crimes requiring the most attention at this time are essentially illegal woodcutting, theft, disturbing the peace, and vandalism.



Vandalism

In addition to coping with increased crime, Forest personnel assist county officials in search and rescue operations.

c. Relationship to the Natural Environment

Beyond serious question, criminal behavior is destructive and harmful to both the biological and physical environments of the Forest.

d. Relationship to the Human Environment

Law enforcement on the Forest is both a property and people problem. Theft of Forest and private property adds to management costs. Thefts and acts of violence, whether against employees or visitors, adds fear to the environment. When people must worry about becoming a victim of criminals, pleasure begins to disappear, and the quality of employees' work begins to suffer. Overnight campers can be terrorized by disturbances such as unacceptable noise, drunkenness, and fights.

The impact of unlawful activity on the human environment can be expected to increase in severity and frequency as the use of the Forest increases along with increases in the nearby population. Future problems include the possibility of anti-social people hiding out on the Forest in violation of Federal laws, and possibly a drastic increase in the theft of natural resources should economic conditions bring hard times.

e. Management Concerns

The very nature of the Forest with its huge expanses of remote, forested lands enlarges the problems of law enforcement which are difficult in the best of circumstances. A Forest officer, for example, may encounter criminals in the act yet be alone and without hope of immediate backup.

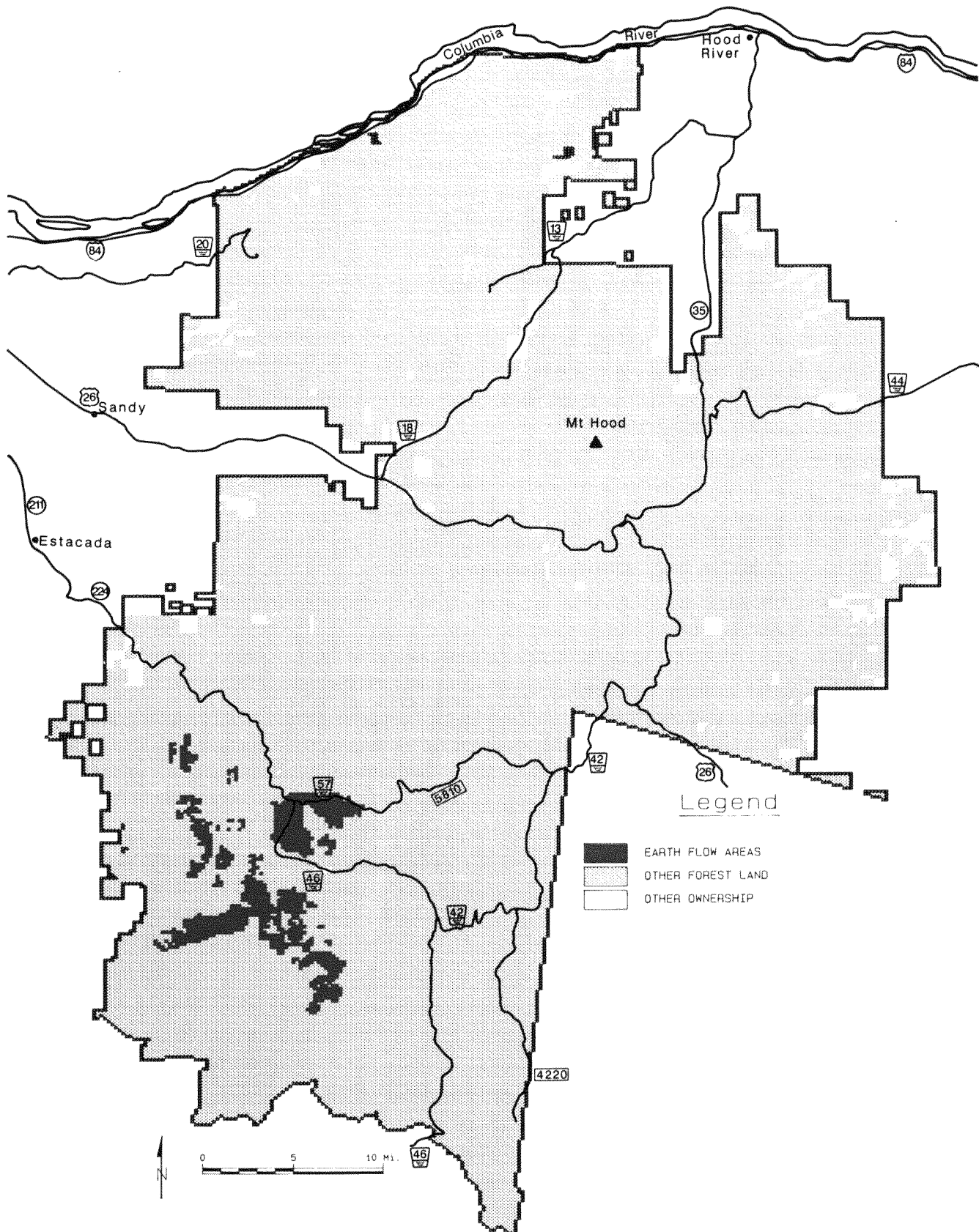
At the present time each Ranger District has its own approach to the enforcement of the many laws and regulations. The ad hoc committee which studied the legal situation in 1981 found that the lack of an overall Forest policy impeded law enforcement. It also reported that the lack of funds, clear definitions of personnel roles in enforcement, and a failure of aggressive follow-through on the processing of cases made current problems more serious.

A major management concern in law enforcement is rising vandalism and theft of logging equipment. Insurance has become more difficult and expensive for logging operators to obtain, and this affects their bidding for Forest timber. Due to their added expense, operators offer lower prices than they otherwise would, and, in effect, U.S. taxpayers are paying the costs of vandal acts.

Another increasing problem is cutting firewood illegally. Snags intended for wildlife use are commonly felled in violation of Forest regulations. Commercial firewood cutters violate their personal use permits. Trespassers, usually hunters or fishermen, misuse the watersheds of the Bull Run and The Dalles which are closed to public use.

A special management concern is the need to maintain cooperative arrangements between county law enforcement officials and Forest personnel. Forest personnel involved with law enforcement include a criminal investigator and "Level IV trained" Law Enforcement Officers with authority to make arrests. The Forest supplements these officers by other Forest officials as situations require. However, local enforcement officers remain responsible for crimes against private property. Sheriffs of the four counties in and adjacent to the Forest are responsible for the protection of visitors through a cooperative agreement with the Forest. Another cooperative agreement between the Forest and Oregon provides for drug enforcement overflights. Coordinating the Forest's internal law enforcement procedures with the law enforcement policies and practices of four different jurisdictions is both urgent and necessary.

MAJOR EARTH FLOW AREAS



CHAPTER 4



Chapter IV - Environmental Consequences of the Alternatives

A. Introduction

This chapter describes the environmental consequences of implementing each of the alternatives discussed in CHAPTER II of this DEIS. This requires discussions of what each alternative would change, how much, and why.

Planned outputs are extensively quantified in CHAPTER II, DEIS, and therefore they are not taken up in detail here. Information provided in CHAPTER III of this DEIS was designed mostly to describe the environment in which the alternatives would be put into effect. Readers are encouraged to refer to CHAPTER III, DEIS, for background information on this chapter's discussions of environmental effects.

1. Impacts of the Alternatives' Activities on Specific Resources

The alternatives' environmental consequences on each resource are first described in terms of direct effects upon a particular component of the environment. These effects may be short term; that is, less than ten years. They may be long term, which is to say more than ten years. Effects may also vary in importance depending on each person's point of view.

Cumulative effects on an environmental component are discussed when such information has value. These effects occur when past, present, and future actions combine to create an impact greater than that of only the proposed Forest Plan.

Potential conflicts between the effects of the alternatives and other agencies' plans and policies are thus discussed, although such conflicts may never actually materialize. The plans of other Federal agencies, Indian tribes, State and County governments are considered in this part of the chapter.

The next section discusses measures to mitigate environmental impacts for each resource area. These measures include:

- Avoiding the impact altogether by not taking a certain action or parts of an action.

- Minimizing impacts by limiting the degree or magnitude of the action and its implementation.
- Rectifying the impact by repairing, rehabilitating, or restoring the affected environment.
- Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action.
- Compensating for the impact by replacing or providing substitute resources or environments.

The first two measures are implicit in the design of some alternatives with respect to most resources. The last three measures are achieved primarily through management direction (see Chapter 4 of the Forest Plan) and are built into the implementation of the selected alternative.

Since we know that environmental consequences follow management practices, it is essential to recognize that the primary control of those practices resides in management direction. A fundamental part of management direction control is in the mitigation of negative impacts on the environment. The management direction provided in all ten alternatives must meet requirements for resource protection, long-term productivity, and mitigation of adverse impacts. Unless otherwise noted, choice of mitigation measures will be made when individual projects are implemented.

Because the components of the Forest do not exist in isolation, any one action can cause a reaction by other components of the environment. Therefore, the section on each environmental component takes up the indirect effects of each environmental component upon other components.

2. Impacts of Alternative Implementation

Any plan for managing the Forest will have unavoidable environmental impacts such as lost amenities and unproduced goods and services. Consequences of this type apply to the preferred alternative as well as to any of the other alternatives. Therefore, the final section of this chapter presents:

- A description of the relationships between short-term use and long-term productivity.
- A section on irreversible and irretrievable commitment of nonrenewable resources.
- A discussion of probable adverse impacts which cannot be avoided.
- A section on environmental conditions unchanged by the preferred alternative.

Much of the analysis in this chapter is based on modeling changes in complex natural systems. The discussion of consequences is also in essence a prediction of future events, a risky enterprise. For such reasons, an important part of the planning process is to establish methods of monitoring the accuracy of predictions and to build a data base for future planning efforts. Implementation of the Forest Plan will involve monitoring of both environmental impacts and the effectiveness of impact mitigation. As monitoring of impacts proceeds, research and information needs can be identified. Implementation and monitoring are discussed in Chapter 5 of the Forest Plan.

B. Environmental Consequences Associated With The Alternatives

1. Physical Consequences

a. Effects of Alternatives' Activities on Geologic Environments

Introduction

Geological hazards are a basic problem in the management of northwest forests. From spectacular destruction to imperceptible creep of soils, geology interacts with activities necessary to the management of the Mt. Hood National Forest. On the Forest, geological impacts are primarily a result of surface soil movement and land instability. Landslide occurrence and surface soil erosion impact other resources like soil productivity and water quality. Impacts on earth flows are related to acreage disturbed. Soil erosion impacts are indicated by the sediment delivery-to-streams index-values of an alternative. (See Chapter II, Table II-15 and Appendix B, Chapter III, F.).

A total of 53,000 acres of earth flow areas are located on the Forest, including active and stabilized areas. The Clackamas, Collawash, Oak Grove Fork, Hot Springs Fork, and Fish Creek watersheds contain deep-seated

earth flows. Earth flow landforms present site-specific problems in resource management. Example: 19,000 of the total earth flow acres are active areas on lands tentatively suitable for timber harvest. The risk for reactivating earth flows and sediment delivery to streams is considerably higher in some alternatives than it is in others.

(1) Direct Effects on Landforms Due to Management Activities in the Alternatives

In all alternatives, such activities as the Forest's timber harvesting methods, road construction, and silvicultural practices affect the rate and volume of rock and soil material displaced by mass wasting. Rapid increases in the rate and magnitude of soil movements can require unplanned changes in management direction and budgets. Rock and soil displacement can cause:

- Loss or degradation of natural resources such as reduced water quality and soil productivity.
- Loss of facilities and capital investments - primarily roads.
- Increased cost and personnel required for management of areas where acceleration has taken place.
- Increased risk of injury or loss of human life.
- Increased surface failures.
- Deformation of trees.

(a) **Effects of Alternatives NC, A, B, and C.** In Alternatives A and NC, timber harvesting in the first two decades would occur primarily on gently sloping timber sites of high productivity. The timber harvest rate of earth flow areas in these two decades would approach the maximum permitted by harvest dispersion requirements. This harvest rate would contribute to a risk of earth flow acceleration or reactivation that is higher in these alternatives than in the others.

Timber harvest activities in Alternative A and NC would also disturb highly erosive soils in earth flows. The section on Soil Resources in this chapter describes in detail the impacts of sediment delivery to streams.

In Alternatives B and C, timber harvesting on earth flow areas could also occur up to the maximum permitted. At this rate, by the third decade, 100% of some earth flows would be in timber younger than 30 years. The loss of high-transpiration trees would add a substantial weight of water to these poorly draining landforms. The added weight of water would increase the risk of earth flow acceleration.

Earth flow areas have highly erosive soils as reflected in the sediment delivery-index values reported in the following section on Soil Resources. However, sediment delivery produced by deep-seated movement of earth flows was not modeled and, therefore, is not reflected in

the index. If the toe of an earth flow is adjacent to a stream, the relative sediment value delivered to the stream could be exponential in comparison to the surface erosion from these landforms.

Exact relationships between water, geologic composition, and the structure of earth flows as they impact earth flow movement are not fully understood. Alternatives A and NC would not provide the opportunity to acquire baseline data on physical and environmental factors needed to determine the dimension, structural characteristics, and mechanics of movement for the slow-moving earth flows. Under Alternatives A and NC, the Forest Service would not test or use an earth flow model to help provide information on impacts of management practices. Monitoring of earth flow areas would occur in Alternatives B and C. The opportunity to study the effects of varying timber harvest levels would be missed since the majority of timber on earth flow areas would be harvested intensively in those alternatives.

Per-acre costs of road maintenance and road reconstruction for Alternatives A, B, and C would be higher on earth flow areas due to their high incidences of surface instability problems. These include slumping and debris slides associated with, and the result of, earth flow movements and saturated soil conditions.

(b) Effects of Alternatives D, E, F, G, H, and I. Monitoring of active, slow-moving earth flows on land suitable for timber harvest would occur in Alternatives D, E, F, G, H, and I. Baseline data would be collected to test existing earth flow models. The tested model would then be used to determine the impacts of management activities and to help identify the best management practices on earth flow areas.

In these six alternatives, timber in earth flow areas would either not be harvested or harvested at a much lower rate than in Alternatives NC, A, B and C. This would provide for a full range of harvesting intensities, silvicultural practices and road densities that could be monitored and studied in earth flow areas. At these alternatives' reduced timber harvest levels, it is unlikely that timber management would produce unacceptable resource damage.

Monitoring and testing would provide information on how to maximize soil water withdrawal. Such information could improve site stability and timber productivity on earth flows. A higher utilization of timber may result if the number of twisted and jackstrawed trees could be reduced. Sediment resulting from earth flow acceleration or reactivation may also be reduced.

These alternatives would provide the time needed to establish the background rate of movement for earth flows. They would allow for five years of measurements after timber harvest. This is important because the maximum

effects of harvest would not appear for five to ten years after cutting. Following the initial period, the monitoring program would provide the additional time needed to study a range of dry and wet years after treatment.

In Alternatives D, E, F, G, H, and I, sediment would be produced from the disturbance of highly erosive surface soils on earth flows in addition to sediment produced from the deep-seated movement of earth flows. Not more than 20% of the highly erosive earth flow surface soil would be disturbed at one time. While there would always be a minimum 80% of an earth flow area occupied with timber 30 years of age or older, harvesting would increase the water content of this poorly draining landform. The degree to which this added water would increase the risk of earth flow acceleration and reactivation is unknown. The risk of sediment-input from earth flows from these alternatives would be substantially less than from alternatives that would allow maximum harvest rates.

(2) Cumulative Effects of Each Alternative on Geologic Hazards

Harvesting timber resulting in the loss of transpiring trees increases water yields in soils. In a transient snow zone, water yield is increased in the winter due to the cumulative effects that occur in clearcuts. In such areas, winter peak flows are higher and soil percolation rates are faster when rain falls on snow packs. In forested plots, water equivalents have been 30% to 50% of those in a clearcut plot due to rain-on-snow behavior in clearcuts. Although water yield is increased in all areas when harvesting occurs, water released on earth flows has a bigger impact than water released on other landforms. On an earth flow, water stays on the site longer due to its characteristically poor drainage. Water added to an earth flow collects into ponds on the surface or saturates the landslide material. Water adds weight to the landform, reduces the strength of the unconsolidated landslide material, lubricates old failure surfaces, and cuts away toe material. Any or all of these impacts can accelerate or reactivate earth flows.

The more timber is harvested on earth flows, the greater is the risk of unstable land conditions on these landforms. Alternatives NC, A, B, and C have a maximum harvest rate on earth flows. Alternatives D, E, F, G, H, and I have a much lower harvest rate on earth flows. Both of these harvest rates are analyzed for earth flows in the alternatives. Harvesting at the maximum rate would yield soil water at a maximum volume of 75% of that which would be predicted if the total area were without vegetation. This maximum level of water yield would be attained in two decades, and would be maintained at that level in succeeding decades. In the alternatives where the harvest rate would be limited by requirements to maintain tree cover, water yield would be at a

maximum volume of 30% of that which would be expected if the total area were without vegetation. This maximum level of water yield would be attained in two decades and would be maintained at that level in succeeding decades. The difference between the two harvest levels in percent harvested per decade is about 28%. But the difference in the impact of water yield between the two harvest levels is 45%. Figure IV-1 portrays this relationship.

Source: Forests and Water: Effects of Forest Management on Floods, Sedimentation, and Water Supply, Anderson, Hoover, Reinhart. USDA, Forest Service, Pacific Southwest Report PSW-18/1976.

Further information is available in "Effects of Clear-Cut Logging on Rain-on-Snow Runoff in Western Oregon: A New Look at Old Studies", USDA-Forest Service, Pacific Northwest Range and Experimental Station, Corvallis, Oregon, by Norr, 1985, and "Comparative Snow Accumulation and Melt, During Rainfall in Forested and Clearcut Plots in the Western Cascades of Oregon", USDA-Forest Service, Pacific Northwest Range and Experimental Station, Corvallis, Oregon by Barris Dm. Harr, 1985.

(3) Conflicts Between the Effects of the Alternatives and Others' Plans and Policies for Geologic Hazards

Alternatives NC, A, B, and C would create more risk of instability. The poor regeneration of timber as a result of land instability would reduce or eliminate timber production on areas of otherwise productive forest land.

Alternatives D, E, F, G, H, and I would allow these lands to continue producing timber with reduced in-

stability as compared to effects from A, B, C, and the No Change alternatives.

(4) Mitigation Measures for Geologic Hazards

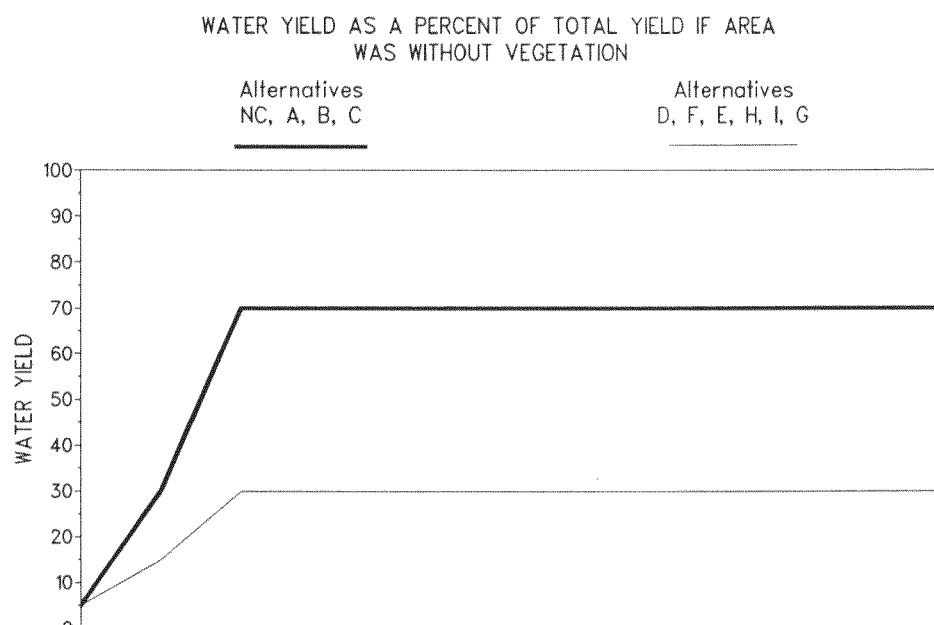
Where high risk potential or known areas of instability are located, the impacts of an activity can be mitigated by:

- Maintaining or improving surface drainage.
- Keeping road construction to a minimum.
- Avoiding areas where the activity would remove weight from the toe or add weight to the head of a slump or earth flow.
- Dispersing and reducing timber harvest in these areas.
- Replacing clearcut silvicultural prescriptions with partial cut prescriptions.
- Eliminating activities on slopes where such activities would likely cause irreversible resource damage.

Forest-wide standards require the implementation of mitigation measures to reduce the impacts of management activities that may activate, reactivate, or accelerate soil movement in areas known to be unstable or with high risk potential. Where irreversible resource damage would occur due to timber harvest, the areas have been removed from the landbase and are classified as land unsuitable for timber harvest.

Earth flows require special management practices to reduce the risk of reactivation or acceleration. Mitigation would be accomplished through a uniform policy of

Figure IV-1



earth flow management which makes sure that activities like road construction and timber harvest do not reactivate or accelerate earth flows. These policies have been designed to prevent an increase in ground water to an unstable area or geologically weak structure, adding weight to the head of a slump, removing weight from the toe of a slump, and disturbing surface water flow.

The problem of water yield on earth flows can be mitigated by limiting created silvicultural openings on these areas to less than 20 acres. The managers can also maintain at least 80% of earth flow areas in timber 30 years of age or older. Adherence to these limits would reduce the risk of reactivating or accelerating soil movements. The major tool to determine which measures are most effective is a monitoring program mentioned earlier in the discussion of direct effects. These mitigation measures have been effective on moderate sized earthflows on this Forest during the 1970's. The larger earthflows, such as the Collawash, are less responsive to individual measures.

(5) Environmental Effects of Changes in Geologic Hazards on Other Components of the Environment

Alternatives NC, A, B, and C would increase ground water levels and would produce more nearly saturated soils. The result would be increased risks of surface debris flows and slumps. Such events would take place either as rapid failures of soil and rock debris (debris slides), or slower, deep-seated failures (slumps and earth flows). These movements provide the majority of sediment delivered to the Forest's streams.

The sediment-delivery index shows related erodability and potential of delivering soil to streams from the highly erosive surface soils on earth flows. The sediment delivery due to deep-seated movement of earth flows is not modeled in the index. It does not show the sedimentation activity which could occur if the toe of an earth flow were adjacent to a stream. In such situations the relative sediment index value delivered could be exponential compared to the surface erosion from these landforms. Alternatives with activities that accelerate earth flows near streams would correspondingly accelerate the sedimentation of streams. In all alternatives except A and NC, such impacts would be monitored and this information made available for future management of such areas.

For all alternatives, road maintenance and road reconstruction would have a higher per-acre cost on earth flow areas due to the high rate of surface instability problems such as slumping and debris slides associated with, and the result of, earth flow movements.

Timber harvest under Alternatives D, E, F, G, H, and I would cause minimum damage to other components of the environment. Twisting, leaning, and jackstrawing of

young trees would be reduced to the minimum due to the reduction of acres subject to movement. Monitoring and testing would provide information to withdraw a maximum of soil water which would improve site stability and productivity on earth flows. A higher utilization of timber may result if the number of twisted or jackstrawed trees are reduced. Sediment from earth flow acceleration or reactivation would also be reduced.

b. Effects of Alternative Activities on Soil Resources

(1) Direct Effects Of The Alternatives' Activities on Forest Soils

Impacts of management activities on the Forest's soils are mainly generated by road building and timber management. Some activities, like fertilization, improve soil productivity. Other activities, like tractor skidding, compact the soil and increase its erosion. These activities cause losses in the growth of succeeding stands and increase the sedimentation of streams. Construction of roads often represents a permanent loss of soil productivity. The total impact of these effects is to reduce water quality, visual quality, and even to impair the productivity of the land itself. The primary cause of reduced soil productivity is compaction caused by skidding and slash-piling with track and wheel-mounted equipment.

(a) Compaction

Researchers such as J.A. Helms (Effects of Soil Bulk Density on Growth Rate of Young Ponderosa Pine, 1984) have demonstrated measurable losses of site quality for both Douglas-fir and ponderosa pine growing in areas where the soil surface has been compacted by ground equipment. Layers of the surface soil where skid trails are used typically exhibit reduced macropore space, reduced infiltration capacities, and increased bulk densities. Seedlings growing in highly compacted soils show lower growth rates compared with seedlings growing in undisturbed sites.

Several factors have been advanced as explanations of lowered yields from compacted sites. These include reduced mycorrhizal function, reduced aeration, and reduced availability of water and nutrients due to restricted root growth. The inability of mycelial strand penetration into compacted areas of the soil could be an important factor in reducing seedling growth. Poor air movement through the soil profile is also thought to be an integral part of the cause-effect relationship. This factor is believed to have increased effects in finer textured soils prone to short periods of water saturation.

The 1981 report of Wert and Thomas, "Minimizing Soil Compaction in Pacific Northwest Forests" 1983, showed

that the effects of compaction can last at least 32 years. Research by Froehlich, et al, "Effects of Skid Roads on Diameter, Height and Volume Growth in Douglas-Fir" 1981, has also shown that while recovery may proceed in the upper 15cm of compacted soil, recovery from compaction below 15cm was not significant after 23 years. Because compaction has such longevity, its effects on soil productivity have serious implications for multiple entries planned for subsequent rotations. Each entry of a stand for thinning with tracked equipment will produce newly compacted ground with unknown effects on future productivity.

The effects of compaction on productivity losses of future timber crops on the Forest are not known with acceptable accuracy. However, research generally indicates that productivity declines when soil is compacted, and that productivity losses from compaction can range from 14% to 73% for Douglas-fir, and 6% to 59% for ponderosa pine. The extent of compaction occurring from tractor harvest and machine piling operations on the Forest cannot be accurately estimated either. Harvesting by ground skidding may result in a range of compaction damage from 3% to 30% of the harvest unit. If ground skidding and machine piling are performed on the same harvest unit, 10% to 47% compaction may result. The interaction of all of the variables involved in compaction, as well as the response of individual soil types to compaction, render accurate predictions of productivity losses not practicable at this time.

Predictions of tractor harvesting and machine-piling acreage on the Forest have been developed from averages of harvesting information presented earlier in the Soils section of Chapter III.

(b) Erosion

Erosion impacts from the alternatives' management activities are the consequences of timber harvest and road construction. Harvest areas exposing bare ground will lose soil in amounts determined by the quantity of soil exposed, the type of soil, the percent of slope, and the amount of time required for the area to revegetate. Road construction and road use involve exposure of mineral soil to erosion. Erosion impacts are twofold. The erosion process not only removes soil from disturbed areas, it may also cause localized reductions in the capacity to grow trees. Erosion on the Forest, according to Richard Wheeler, Forest Hydrologist, is most pronounced in tractor harvest areas and on steep ground where road construction, timber harvest, and fuel treatment have exposed mineral soil. Wheeler also states that the amount of soil actually removed depends on slope, soil type, and type of activity. For example, tractor harvest operations result in far more erosion than cable harvest.

Erosion also delivers eroded soils as sediment into streams, lakes, and rivers. While some sediment must be expected in any body of water, excess sediment can reduce fish habitat and water quality. Sediment effects are taken up in detail in the section Aquatic Resources, but it is worthwhile to mention briefly sediment indices in this section.

The sediment index is precisely that, an index, but it is useful as a broad indicator of roughly how much erosion is happening in a given area. The index reports in thousands of tons of delivered sediment and therefore appears to be an output, but in reality its function is as an index, not a true sediment value. As a relative measure of sediment produced and delivered to streams, the sediment index consists of two parts. One part is the potential for soil to erode; that is its erodability coefficient. The second part is the potential for eroded soil to be delivered to streams as sediment - the delivery coefficient. The index does not include the possible contributions of destabilized earth flows, or any reduction in sediment delivery due to riparian management practices.

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 in Chapter II, Table II-15.

Due to the different methods of deriving the activity-sediment index and the "background" sediment coefficient, they cannot be added to one another as having the same individual levels of accuracy. However, 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 activity sediment delivery-index is a model that has been used to help assess impact trends between alternatives. However, the model was not designed to determine absolute effects of alternatives.

(c) Fertilization

Positive impacts from fertilization should occur under all alternatives although the benefits will vary. Fertilization with urea will increase the amount of nitrogen available to plants. Findings of Michael McArthur, Forest Soil Scientist, showed that this is especially productive on generally nitrogen-poor soils of the lower site class on the Forest. Richard E. Miller and Steven R. Webster in "Fertilizer Response in Mature Stands of Douglas-fir," 1979, reported that fertilization would produce a short-term (10 year) increase in soil productivity. The result would be increased tree growth and the productivity of

other species until the nitrogen would be used up or leached out. No fertilization is planned for the first decade in any alternative.

(2) Direct Effects of Management Activities on Forest Soils by Alternative

Alternative NC

In the first and second decades of this Alternative, tractor harvesting would occur on 31,600 and 22,600 acres respectively. Machine piling would occur on 12,750 acres in the first decade and 8,800 acres in the second. Total sediment delivery index would be 445,000 tons in the first decade, 397,000 tons in the second decade, and 309,000 tons in the fifth decade. No fertilization is planned.

Alternative A

In the first and second decades of this Alternative, tractor harvesting would occur on 23,450 and 15,600 acres respectively. Machine piling would occur on 22,000 acres in the first decade and 11,400 acres in the second. Total sediment delivery index would be 313,000 tons in the first decade, 290,000 tons in the second decade, and 270,000 tons in the fifth decade. No fertilization is planned.

Alternative B

In this Alternative, 26,300 acres of tractor harvest would occur in the first decade. Tractor harvesting would decline to 21,600 acres in the second decade. Total acreage for machine-piling in the first and second decade is 10,200 and 8,400. This high level of tractor activity would be the result of higher levels of scheduled timber harvest under Alternative B. Total delivered sediment index would be about 378,000 tons in the first decade, 359,000 tons in the second decade, and 297,000 tons in the fifth decade.

According to the activity-sediment and delivery-to-streams index values, a high level of sediment would be reduced in decades one through four. Soil erosion impacts would be dispersed to all drainages, but some drainages with large, unroaded acreages would have more harvest activity. Steep, high sediment-producing slopes would be roaded. As much as one-third of the total area of high sediment-producing earth flows may be harvested per decade. First decade sediment delivery-index values would be slightly higher in most subdrainages.

Fertilization would treat about 900 acres annually by the second decade.

Alternative C

Tractor harvest would occur on 27,000 acres in the first decade, followed by 20,000 acres Forest-wide in the second decade. Acres treated by machine-piling and

fuel-preparation would be 10,000 in the first decade but decline in the second decade to 8,000 acres. The decline would occur uniformly over the Forest.

Total delivered sediment is estimated at 441,000 tons, 423,000 tons, and 313,000 tons in the first, second, and fifth decades respectively. According to the activity sediment-delivery-to-streams index values, a high level of sediment would be produced in decades one through four. Impacts of soil erosion would be dispersed to all drainages; however some drainages with large, unroaded acreages would have more harvest activity. Steep, high sediment-producing slopes would be disturbed.

Maximum allowable disturbance would occur on high sediment-producing earth flows. The first decade's sediment index values would be slightly higher in most subdrainages. Alternative C would have additional impacts of sediment produced in the Bull Run Watershed.

Fertilizer would be applied at the rate of 1,300 acres per year in the second decade.

Alternative D

The high levels of harvest planned in this alternative result in 26,300 acres of tractor harvest in the first decade. Acres harvested by tractor would decline to 18,800 in the second decade. An additional 10,750 and 7,300 acres of machine-piling would occur in the first and second decades respectively. The decline would occur predominantly on the west side of the Forest in response to the drop in total timber harvest scheduled in the second decade.

Total sediment delivered to streams would be about 371,000 tons in the first decade, 331,000 tons in the second decade, and 259,000 tons in the fifth decade. First decade activity-sediment index value would be 25% greater than in the next three decades. Activity sedimentation would decline radically in the fifth decade. Approximately two-fifths of the Forest's riparian acres would be protected under this alternative which would help to reduce the impacts of sediment delivery. Riparian areas can act as buffers to sediment delivery to streams, but this effect is not modeled in the sediment index. Less disturbance on high sediment-producing earth flows would take place since these areas would be harvested at no more than 4% per decade. Fertilizer would be applied to 800 acres annually in the second decade.

Alternative E

Acres of tractor harvest in the first decade will be 17,070 while machine-piling occurs on 6,670 acres. In the second decade tractor harvest levels dropped to 14,030 acres. Machine-piling will be prescribed on 5,730 acres in the second decade.

Total delivered sediment levels begin at 348 thousand tons in the first decade, decline to 317 thousand tons in the second decade and further decline to 259 thousand tons in the fifth decade.

The highest activity-sediment index value in alternative E occurs in the first decade. In decades two through four the value decreases slightly. Approximately two-fifths of the riparian acres will be protected with this alternative. This will help reduce the impacts of sediment delivery. Riparian areas can act as buffers to sediment delivery to streams. There will also be less disturbance on high sediment producing earth flows.

Fertilization will occur on 750 acres per year in the second decade.

Alternative F

In the first decade, 11,400 acres of tractor harvest and about 4,200 acres of machine-piling would occur. Second decade levels of tractor harvest and machine-piling would be 12,300 and 4,900 acres respectively.

Total delivered sediment would amount to 262,000 tons in the first decade, 274,000 tons in the second decade, and 226,000 tons in the fifth decade. Alternative F requires full protection of the riparian areas, and these areas will likely act to buffer the sediment delivery to streams. Therefore only a slight increase in sediment would occur through the first three decades. Taken on the whole, this alternative produces low levels of sedimentation. Erosion from high producing earth flows would be minimized in this alternative.

In the second decade, 400 acres would be fertilized annually.

Alternative G

In the first decade, tractor harvesting under this alternative would occur on 23,450 acres followed by 15,600 acres in the second decade. Machine-piling would occur on 22,000 acres in the first decade and 11,400 acres in the second decade.

Total delivered sediment levels would amount to 317,000 tons in the first decade, 308,000 tons in the second decade, and then drop to 258,000 tons by the fifth decade. Activity sediment would hold at the same level in decades one through four. Sediment values would then drop sharply. In the first decade, because scheduled harvest emphasizes the better Douglas-fir areas, sediment production on the Forest due to harvest activities would occur mainly on the west side sub-drainages. There would also be less disturbance on high sediment-producing earth flows since no more than 4% of these areas would be harvested per decade.

1,900 acres would be fertilized annually in the second decade.

Alternative H

In the first and second decades under this alternative, 4,900 acres and 4,850 acres would be tractor-harvested respectively. Acres of machine-piling in the first and second decades would be 1,900 acres and 2,200 acres respectively.

Total delivered-sediment indices predict 212,000 tons in the first decade, 217,000 tons in the second decade, and 230,000 tons in the fifth decade. In this alternative, sediment due to ground disturbance from harvest activity would be low. Levels of sediment would remain low in the second decade but increase threefold in the fourth decade. Alternative H requires full protection of the riparian areas, and these areas would likely buffer sediment delivery to streams. Erosion from high sediment-producing earth flows would be minimized.

Roughly 200 acres would be fertilized annually in the second decade.

Alternative I

In the first decade of this alternative, 9,500 acres would be tractor harvested. In the second decade, tractor harvest would increase to 11,200 acres. Areas of machine-piling under this alternative would total 3,600 acres in the first decade and 4,600 acres in the second decade. Delivered sediment would total 247,000 tons in the first decade, 259,000 tons in the second decade, and 218,000 tons in the fifth decade.

A slight upward trend in activity-produced sediment would occur over time in Alternative I. Sediment levels through the first three decades would remain nearly constant. Activity in the fourth decade would be 1.4 times that of the first decade. Alternative I would protect two-fifths of the total riparian areas. High sediment-producing earth flows would be harvested at a reduced rate in this alternative.

In the second decade, fertilization would be carried out on 400 acres per decade.

(3) Cumulative Effects of Compaction on Soil Resources

The cumulative effects of compaction would involve sale areas on the Forest which have been entered by tractors more than once. Repeated entry for skidding or piling has a cumulative impact. For example, under current direction compaction-damaged soils have reached an estimated 30,000 acres and roughly 500 acres a year increase the existing total. These acres represent a long-term (approximately 30 year) reduction in soil productivity on heavily damaged sites.

Erosion may have cumulative effects on the ability of the soil to produce timber and forage. In addition, there may be loss of fish habitat and water quality as described later in this chapter.

(4) Conflicts With Other Plans and Policies

Sediment delivered into waters used by resident and anadromous fish may create conflicts between the Forest Service and a number of organizations. The discussion of aquatic resources in this chapter provides more information on this possibility.

(5) Mitigation Measures For Soil Resources

(a) Compaction

To mitigate the impacts of compaction, a variety of modifications and alternatives to tractor operations may be utilized. Since soil moisture is a major determinant of soil structural strength, compaction damage can be reduced by limiting tractor harvests to periods when soil moisture is relatively low. A more costly mitigation measure would be to require harvest methods other than tractor in soils where compaction hazards exist. High lead and other cable systems can remove timber with very little compaction, although the cost is much higher. Low-ground-pressure vehicles can also be used, again at higher cost. Designating skid trails that operators must use during harvest is yet another means of mitigating the damage caused by compaction. Predesignating the skid trail system before timber removal is another means of reducing the extent of compacted skid trails. Alternatives to piling slash by tractor include broadcast burning, lopping and scattering, and hand-piling. These methods, especially hand-piling, are costly, and broadcast burning may have impacts on soil fertility, air quality, and fire risk. The total amount piled and therefore the amount of passes the machines must make can be reduced by encouraging woodcutters to remove as much material as possible.

Soils already compacted can be rehabilitated by subsoil tillage of compacted ground. This is basically similar to plowing a field, and recently developed tools have made the process practicable.

The effectiveness of these mitigation techniques is poorly understood, with lack of data hampering a concise rating of mitigation success. Techniques which are thought to be highly effective include limiting tractor harvest on poorly drained soils, predesignated skid trails, and cable yarding. The effectiveness of subsoil tillage depends upon the type of implement used, soil type, and moisture content.

The effectiveness of measures to mitigate compaction will be tracked using a point sampling system. Long term changes in productivity will be tracked through measurements of tree growth taken at five year intervals.

(b) Erosion

Mitigation of erosion impacts can be achieved in different ways. Practices that rectify adverse impacts include water barring of skid trails, grass seeding of exposed soil, and mulching. A grass/mulch mixture is often applied to cut and fill slopes of Forest roads.

The use of cable systems to reduce acreage harvested by tractor can minimize erosion impacts. Broadcast burning can be timed and executed to avoid removing the duff layer. Strips of timber and brush can be left along creeks to serve as sediment filters. Culverts can be closely spaced to prevent water in roadside ditches from traveling long distances. The idea is to place a culvert on either side of a stream culvert to minimize the amount of water that would flow directly from ditch to stream. A variety of retaining structures can be used to channel water flow and prevent soil movement. Roads that have served their purpose can be ripped and seeded, "put to bed," so that the area can once again support vegetation. Heavily used roads or roads in sensitive areas can be paved in order to reduce sediment produc-



Paving reduces sediment production from roads

tion.

Broadcast burning when duff moisture is high is very effective in reducing erosion impacts. Closely spaced culverts are a very effective mitigation tool for preventing delivery of soil to streams. Water bars are very effective in mitigating soil loss from erosion.

The effectiveness of erosion control measures will be monitored through accomplishment reports for various erosion control projects.

(c) Fertilization

Fertilization impacts on water quality can be avoided altogether by applying fertilizers in amounts and on locations which will prevent depositing them into streams.

(6) Effects of Changes in the Soil Resource on Other Components of the Environment

Adverse impacts on soil productivity may reduce allowable timber harvest on the Forest. Current harvest schedules are based on predictions of future tree growth, and harvests will be reduced if growth is retarded by compacted soils. Reduced growth of forbs and shrubs would reduce the number of grazing and browsing animals which can occupy a given piece of ground. Reduced infiltration rates would increase the dangers of flooding. Eroded materials would tend to choke stream channels, and therefore any increase in erosion would further increase the likelihood of flood. Sediment increases are correlated with reductions in anadromous fish populations. This in turn may lead to conflicts with Oregon Department of Fish and Wildlife, the Confederated Tribes of the Warm Springs, the Columbia River Intertribal Fish Commission, and various sport and commercial fishing groups.

c. Effects of Alternative Activities on Air Quality

Introduction

The primary impact on the Forest's air quality comes from particulates produced by wildfires and burning prescribed by various alternatives.

The impact of particulates on visual quality is a major problem, especially with respect to Class 1 areas as defined in the Clean Air Act. On the Forest, the Mt. Hood Wilderness and a part of the Mt. Jefferson Wilderness Area are designated Class 1 areas. The section on air quality in CHAPTER III contains a description of air quality standards.

(1) Direct Effects of Alternatives and Activities on Air Quality

Alternatives with the highest timber harvests would produce the highest levels of suspended particulates from prescribed burning. This is shown in Figure IV-2.

These projections represent substantial reductions from current quantities of suspended particulates currently produced on the Forest. Using 1976 through 1981 as a base period, current particulate production is about 110,000 tons per decade. That tonnage is in itself much reduced from earlier decades because particulate production has dropped as the amount of slash requiring disposal has dropped. Since 1975, the average quantity of slash burned per acre of harvest has declined from 77 to 40 tons. This trend reflects more efficient utilization of wood by wood processors, as well as more woody debris being left on site by managers to fulfill its role in forest ecosystems. The decline in amount of slash burned is expected to continue.

Figure IV-2

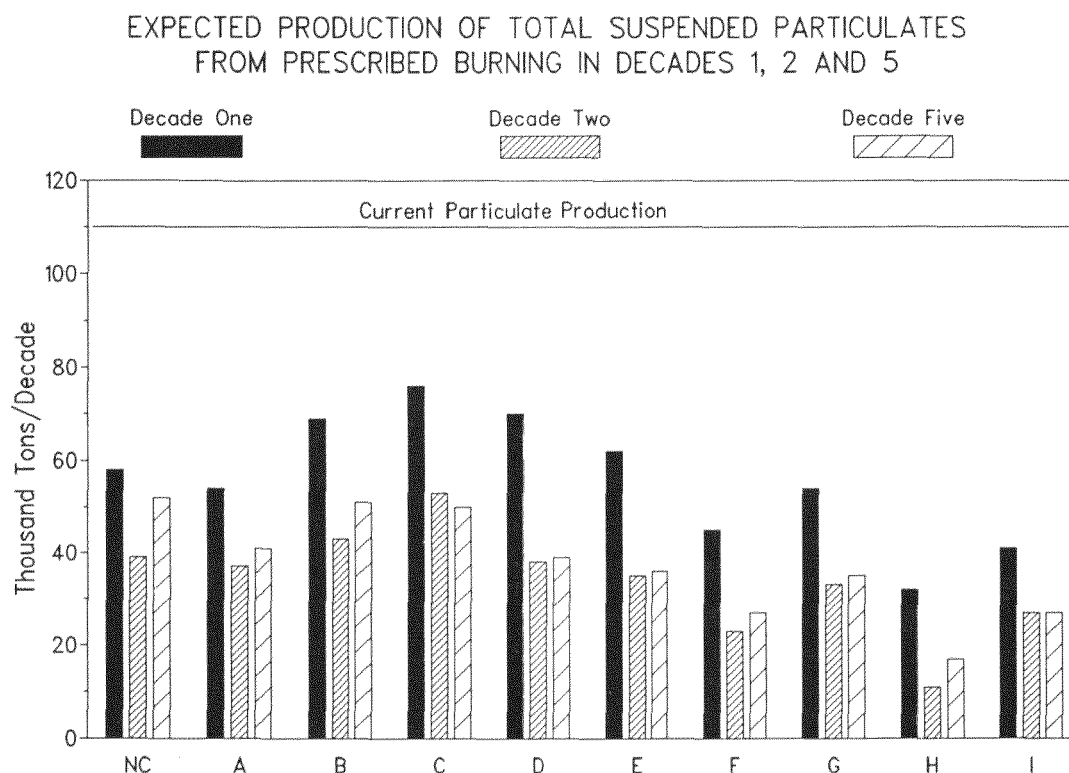


Table IV-1 shows the acreage where prescribed burning would occur in support of timber management activities.

Suspended particulates, whether from natural or man-made sources, reduce visibility on and off the Forest. Natural sources of particulates include clouds and air with a high moisture content. Manmade sources are mainly particulates from prescribed burning both on and off the Forest. During the summers of 1982-84, the State of Oregon, Department of Environmental Quality (DEQ) and the Forest conducted visibility monitoring at Hickman Butte Lookout for the Mt. Hood Wilderness. Median visual range within the Wilderness averaged 74 miles with a range from 11 miles to 138 miles. The average of impaired visibility from manmade sources during the period from July to September was 140 hours. Impairment was considered "just perceptible" for 80 hours, "moderate" for 46 hours, and "heavy" for 16 hours. Therefore impairment of visibility from manmade sources averaged 13% of the daylight hours or 1 1/2 hours per day. Impairment was moderate or heavy only 6% of the daylight hours representing 45 minutes per day. About 30% of the hours with impaired visibility were affected by dispersed plume impacts while 70% were impaired by regional haze.

Figure IV-3 shows the projected reductions from current levels of suspended particulates issuing from prescribed burning under all alternatives. The table clearly shows that alternatives with low levels of timber harvest produce the greatest reductions in particulates. Alternative H, for instance, would reduce particulate production 90% or more by the turn of the century.

Reductions of particulates projected in **Figure IV-5** would be accomplished through improved utilization of wood residues, less burning of woody debris left on the site and burning when production of particulates would be minimal. The impairment to visibility from dispersed plume impacts should also be reduced by these percentages because particulate production correlates directly to visibility impairment. Furthermore, utilization of the Oregon Smoke Management Plan and scheduling

prescribed burning when environmental conditions are optimum would reduce plume impacts.

(2) Cumulative Effects Of the Alternatives On Air Quality

Particulates produced by burning slash on the Forest can combine with emissions from field burning, auto exhaust, and industry to form regional haze. While the problem of regional haze is beyond the scope of this statement, Forest management activities will be modified in recognition of the role of burning slash as a component of regional haze.

(3) Conflicts Between The Effects Of The Alternatives And Other Air Quality Plans And Policies

The State of Oregon has put into effect an Oregon Smoke Management Plan setting up "designated areas" where high population or recreation sites, such as some Wilderness Areas, call for restrictions on smoke production. All of western Oregon and small parts of eastern Oregon are restricted areas in which smoke emissions are monitored through the burning permit system. The Forest Service will remain in compliance with smoke-emission restrictions in all alternatives.

(4) Mitigation of Air Quality Impacts

New technology and techniques have greatly improved the efficiency of prescribed burning operations. At the same time, research continues to confirm the vital role fire plays in forest ecosystems. To continue using fire in managing the Forest, it will be necessary to mitigate undesirable impacts as much as possible.

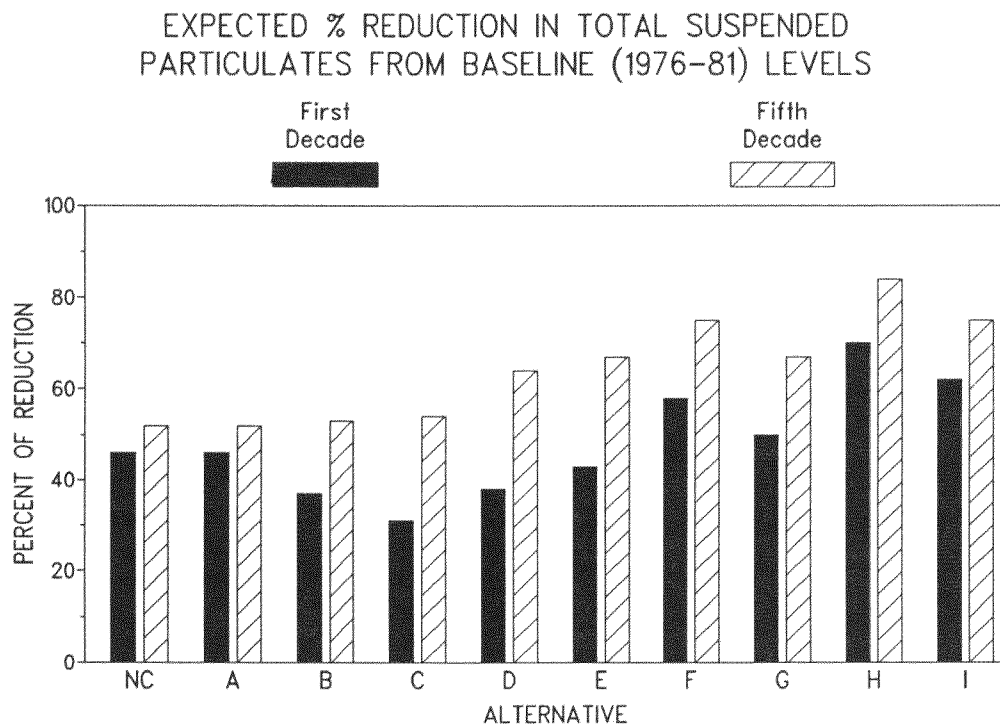
Perhaps the most effective form of mitigation is the timing of burning operations. Correct timing, such as burning in the spring, can reduce the amount of fuel consumed due to higher fuel moisture. Burning when smoke will ventilate into the upper atmosphere or away from centers of population and Class 1 areas would also reduce impacts. Burning in periods of low visitor use would reduce impacts on Forest visitors especially in Class 1 areas. The method of ignition itself can mitigate

Table IV-1

Expected Number Of Acres Where Prescribed Fire is Used for Fuel Treatment and Site Preparation
(in thousands of acres)

	ALTERNATIVES									
	NC	A	B	C	D	E	F	G	H	I
Decade 1	89.0	75.5	89.0	97.6	89.5	80.4	58.9	70.5	41.9	53.6
Decade 2	56.0	50.1	56.0	68.7	48.8	45.4	30.0	42.9	14.1	34.7
Decade 5	66.1	67.0	66.1	64.3	50.9	46.2	35.5	45.8	22.0	34.6

Figure IV-3



impacts. Mass ignition would minimize the transfer of heat

downward and reduce the longevity of the smoldering phase of combustion.

Directional felling will reduce breakage with corresponding reductions in fuel loading. Increased utilization of currently substandard material would reduce the presence of smoldering fuels and the need to burn anything at all. Removing wood for home heating would also reduce loading. Stimulating increased uses by woodcutters could greatly reduce the volume of slash requiring disposal. This step could create some different problems since many woodcutters would burn this fuel in the Portland metropolitan area where air pollution is already a problem. Finally, alternatives to burning, like chipping and crushing, would be used wherever practicable.

Volumes of suspended particulates would also be reduced by restrictions on prescribed burning, particularly broadcast burning. The main substitute for broadcast burning would be yarding of unmerchantable material (YUM). Under this technique, logs of a certain size would be dragged to a landing for disposal. Assuming

that disposal would be at least partly by non-burning means, this method would substantially cut production of suspended particulates. Yarding techniques have the concurrent effect of encouraging utilization of material previously considered cull. Once hauled to a landing, much more of this material would be utilized than if left in the unit. Demand for this type of material is increasing and should contribute to future reductions in suspended particulate production.

The above mitigation measures are very effective in mitigating air quality impacts as shown in Figure IV-3. Predicted reductions in particulates are based on emission factors, acres treated, and treatment type. Reductions from current levels are a direct result of the mitigation measures described above. Timing of burning operations has already proven very effective in mitigating air quality impacts. Burning under favorable ventilation conditions has significantly reduced impacts, as has spring burning.

Utilization standards have steadily increased over the past decade, with corresponding reductions in tonnage burned, and consequently, reductions in air quality impacts.

Air quality will be monitored to assure compliance with the Oregon Department of Forestry Smoke Management Plan.

(5) Effects of Changes in Air Quality on Other Components of the Environment

The effect of wood smoke on human health is negligible at the concentrations under discussion. Even though negligible, however, the addition of any polluting agent into the atmosphere should be minimized. Reductions in emissions of suspended particulates would noticeably increase the visual quality on the Forest.

Fire is an important tool for the task of vegetation management and site preparation on the Forest. Restrictions on the use of fire to minimize the impairment of visibility would affect the Forest's ability to reforest the land. The effects would vary in degree, but they would be most significant in any alternative with an annual timber sell greater than 315 MMBF, i.e. all Alternatives except F, G, H, and I. At harvest levels above this point the number of days when burning is feasible would be insufficient to accomplish site preparation. This would result in delayed reforestation of lands requiring site preparation.

Fire is also an important natural component of the Forest's ecosystems, especially on the east side. Excluding fire from these ecosystems in the past has resulted in fuel loading increases. Wildfires in these areas burn more acres at a higher intensity with resultant increases in damage than would have occurred had nature been left to run its normal course.

d. Environmental Consequences of Alternative Activities on Vegetation

Introduction

Most of the environmental impacts discussed in this DEIS are due to changes in vegetation. The treatment or nontreatment of vegetation significantly affects the Forest's visual and recreational characteristics; the wildlife species that inhabit the lands; the size, age, health, and vigor of the forest stands, their susceptibility to insects and diseases; and the quality of water draining from the Forest. Off-Forest considerations revolve around the flow of wood to area mills and the maintenance of certain habitats which are no longer available outside the Forest.

This section discusses the effects of various alternatives' activities on vegetation. These effects result primarily from timber management activities.

(1) Factors of Control in Timber Management

The amount of timber management which takes place on the Forest depends to a great extent on the acres available for timber harvest, the rates of harvest, and the loca-

Figure IV-4

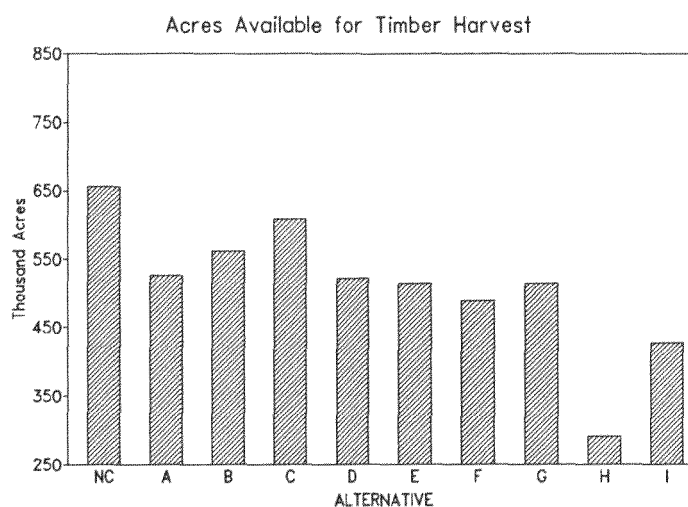
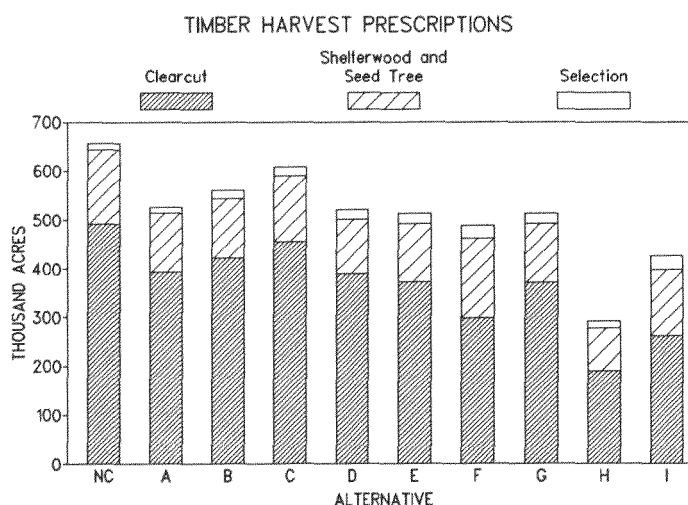


Figure IV-5



tions of harvest. The amount of land available for timber harvest and types of harvest vary considerably as shown in Figures IV-4 and IV-5.

Other timber management activities that affect vegetation include planting of harvest areas, precommercial thinning, fertilization, and commercial thinning. Figures IV-6 through IV-9 show how these activities would vary by alternative.

Some management areas, emphasizing such objectives as scenery, earth flows, and riparian areas, are subject to timber harvest at a limited rate and under carefully controlled conditions.

Wilderness areas are not available for harvest although Wilderness is undergoing changes in vegetation structure

Figure IV-6

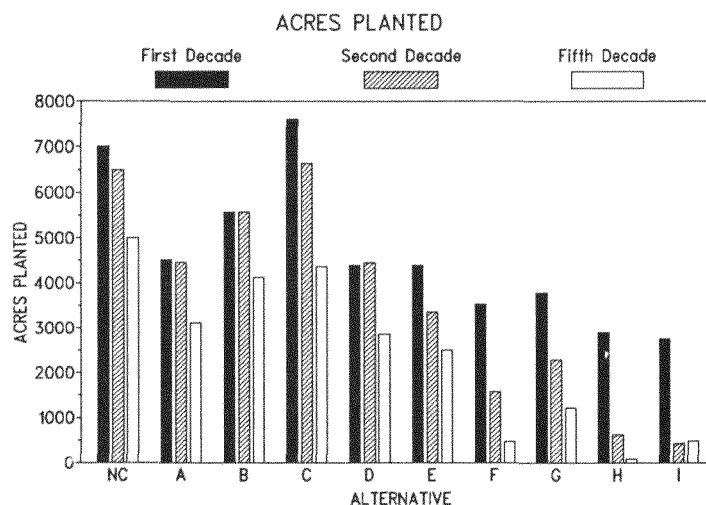


Figure IV-7

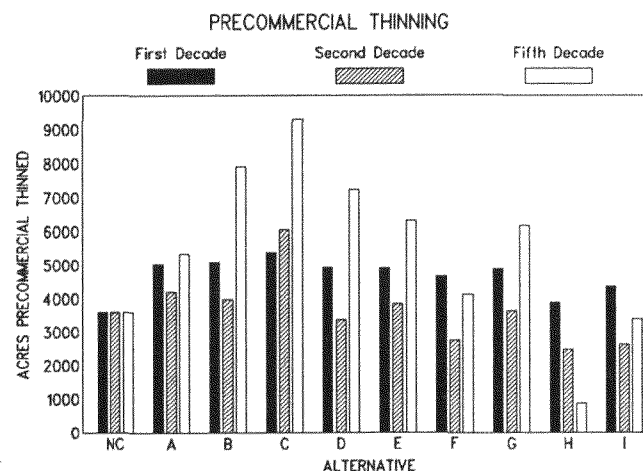


Figure IV-8

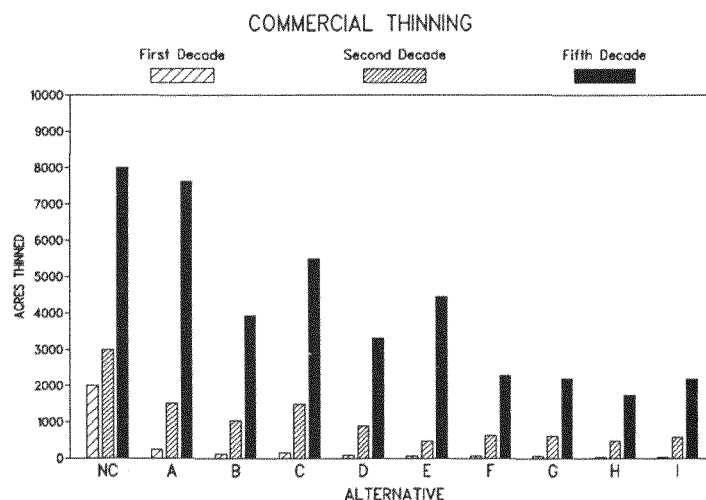
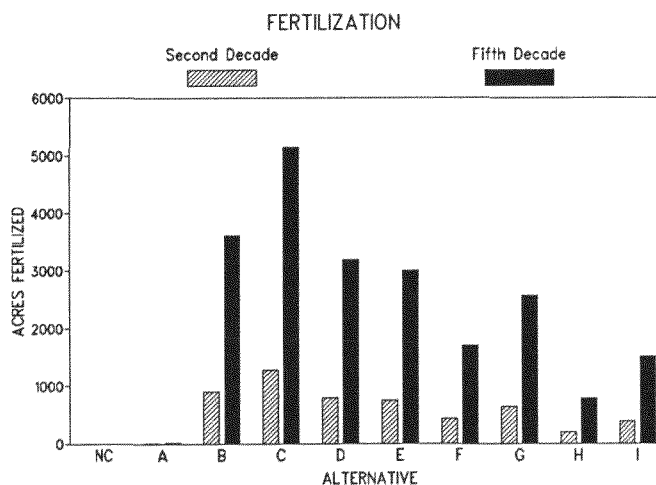


Figure IV-9



despite withdrawal from the commercial timber base. These changes are the result of fire exclusion.

As explained in the discussion of fire management in Chapter III, fire suppression may slow natural succession, change the composition of species, and increase fuel loading. Suppression also can prevent large areas of timber from being killed by fire which often prevents conversion of old-growth stands to brush or young trees. The situation will change under new Wilderness fire policies designed to allow fire to resume its natural role in the Forest's ecosystems. Additional details on these policy changes are available in the section on Wilderness fires in this chapter.

The biological setting of timber management activities plays a key role in the magnitude of their effects. In order to discuss these effects on a logical basis, the

biological settings of the Forest's vegetation have been divided into:

- West side vegetation
- East side vegetation
- High elevation vegetation
- Riparian vegetation
- Alpine vegetation, permanent grasslands, and talus communities have been omitted because their management does not vary significantly by alternative.

The timbered portion of the Forest has also been divided into stages according to the age of a stand. These are the generally recognized age-classes that occur in all forested zones:

Table IV-2
Timber Stages By Age Class

Class (Timber Stage)	Approximate Age Class
Seedling	0-10 Years
Sapling	10-20 Years
Pole	20-100 Years
Mature	100-200 Years
Old Growth	200+ Years

Age-classes are important to this discussion because the amount and distribution of various age-classes have widely differing values for wood fiber, wildlife habitat, water quality protection, and visual quality.

(a) West Side Vegetation: western hemlock, Pacific silver fir zones

Major changes take place on the Forest when old growth is harvested, the site prepared for reforestation, and planted. These activities change the size of vegetation, its composition, species mixture, relationships between individual plants, and even the climate of the immediate area (microclimate).

Analysis of the impacts on vegetation can best be conducted by describing the changes which would take place in a typical west side vegetation community. A typical stand of middle-elevation old growth contains an overstory of Douglas-fir, western hemlock, western red cedar, and a generous sprinkling of snags. Most trees are about 250 years old. An occasional Douglas-fir is much older, having survived an earlier forest fire. The understory is composed of western hemlock and western red cedar saplings, vine maple, rhododendron, and an occasional Pacific yew. The forest floor is covered with moss and shade-tolerant herbs, along with several fallen trees in various stages of decay.

When this stand is clearcut, the new plant community starts much from scratch. Plant succession begins on ground cleared by broadcast burning or mechanical scarification. Planted conifer seedlings, usually Douglas-fir, and common forbs like fireweed are the first to occupy the site. This stage gives way to shrubs such as vine maple and rhododendron, and saplings. Precommercial thinning and brush control activities are undertaken at this stage if the alternative calls for intensive manage-

ment. During these activities trees and brush are removed, at least where they compete with crop trees.

Within the original stand, the rather wet, shady environments had little daytime temperature variation and low windspeeds. But in the cleared area the environment is hotter and drier in summer, colder and wetter in winter. Windspeeds are higher and frosts more frequent. In short, the climate is more extreme. As this managed stand grows up, the environment within the stand will gradually return to a microclimate similar to that in the old stand. Variations in temperature and humidity will become less extreme.

In shelterwood harvest, the effects just described are modified considerably by the retention of an overstory. Far more shrubs and forbs generally survive from the old stand, and sun-loving forbs are less abundant. In the initial stages of a shelterwood, the microclimate within the stand has more shade and less daytime temperature variation than in the clearcut. After the new stand is established, the overstory is removed and conditions become similar to those in a clearcut, at least with respect to light levels and temperature variations.

The effects of selection, group selection, and commercial thinning are more subtle than those just described. Removing individual trees and groups of trees has little effect on microclimate. The main effect is to provide sites for the germination of shade tolerant species such as hemlock and silver fir.

(b) East Side Vegetation: mixed conifer, ponderosa pine zones, and the pine/oak sub-zone



Pine Oak Woodland

The effects of alternative activities on east side vegetation are roughly similar to the effects described for the

west side. However, effects are complicated by the variety of species and stand histories on the east side.

As with stands on the west side, managed stands do not resemble the original wild stands. Trees in managed stands may never attain the large diameters seen in wild stands. Managed stands have fewer species. Large snags and down woody debris are less abundant.

Suppression of fires has caused major changes in the composition of vegetation and fuel loading on east side forests. Natural fire intervals are much shorter on the east side, and suppression has significantly reduced the impacts of fire.

Periodic outbreaks of insect epidemics are a factor in the dynamics of east side stands. Spruce budworm appears to be the most destructive of these forest pests. Available evidence indicates that fire suppression and timber management practices have increased the extent and severity of budworm attacks. Timber management tends to remove old ponderosa pines, and fire suppression tends to encourage grand fir and Douglas-fir reproduction on dry sites. The combination of these factors tends to produce an ideal environment for the budworm.

(c) High Elevation Vegetation: mountain hemlock, portions of the Pacific silver fir zone

Vegetation at elevations of 4,000 feet and higher, such as those in the mountain hemlock and silver fir zones, are affected in ways similar to those described for west side stands. The major difference is that establishing stands is very difficult and all growth is much slower. Commercial thinning is seldom used because trees grow more slowly. Broadcast burning is rarely used due to thin soils and the harsh climate. Also, young stands tend to close up very slowly; that is, openings persist for some time after a new stand becomes established. Finally, effects from mechanical damage are much more common in these stands than in stands in other zones.

(d) Riparian Vegetation

Riparian ecosystems present the most diverse array of site conditions in the land base. The main forested component of vegetation immediately adjacent to streams are alder and cottonwood stands. These areas also encompass various shrub types like willow, as well as sedges, rushes, and other vegetation that grows where supported by seasonal flooding or shallow water. Riparian areas also include wetlands (marshes, bogs, wet meadows, ponds, etc.), lakes and reservoirs, and seeps and springs within the Forest or streamside portions of previously described vegetation zones, though species composition is different. On the west side, streamside parts of the western hemlock zone and Pacific silver fir zones are often dominated by western red cedar. East

side riparian areas are often bordered by Engelmann spruce, western red cedar, and lodgepole pine. At high elevations, riparian sites grow sitka alder, Engelmann spruce and occasionally, Alaska yellow cedar.

Riparian vegetation is needed for the maintenance of water quality, fish habitat, and wildlife habitat. All alternatives provide different levels of management emphasis for these resources, but the effects of the emphasis varies substantially between alternatives. Most effects in riparian zones will be of lesser magnitude than in other vegetation zones due to several factors. When timber is clearcut, unit size will be relatively small, streams will be shaded by buffer strips, uneven-aged management will be used in many locations, and slash treatment will not be as intensive. These practices will leave more woody debris in streams and on the ground for wildlife habitat.



Streamside Vegetation

(2) Direct Effects of Management Activities on Vegetation by Alternative

Alternative NC

Alternative NC continues current vegetation management. Under this alternative, the Forest would manage 656,000 acres for timber harvest, and in the first decade the annual harvest would be 482 million board feet, total program sale quantity. In the first decade, cutting would be concentrated on the west side where volumes are high. Old growth would be significantly reduced, and by the fifth decade nearly all available stands more than 150 years old would be converted into young, managed stands. The total number of timber species in many stands would be reduced and age-class distribution would be narrowed.

At this level of harvest, planting would average 7,000 acres per year. This activity would remain constant throughout the first and second decades. Planted species would consist primarily of Douglas-fir, noble fir, or ponderosa pine, depending on site conditions. Brush

species which compete with crop trees would be controlled. Vegetation management in this alternative would be intensive, with mature and over-mature trees removed at a steady rate.

Intensive levels of timber management would be maintained under this alternative for most riparian zones and their associated areas. About 5,000 acres of streamside management areas would be excluded from harvest to protect them until a satisfactory harvest method is developed.

The character of riparian vegetation would show increasing alteration on two-thirds of the Forest or more. The diversity of vegetation by types and age-classes, and streambank cover and stability would be reduced. These changes would be most visible in drainages of the Clackamas River and least visible in the Columbia and Bull Run drainages and The Dalles Watershed (a portion of the Miles Creek drainage).

The overall character of vegetation effects produced under this alternative would be intensive vegetation treatment with many 10 to 40-acre stands of trees from zero to 100 years old interspersed with an occasional patch of old growth. By the end of the period (50 years), the Forest would contain large acreages of trees in the 10 to 50 year age-class. These stands would be well stocked with conifers and age and height variation within stands would be minimal.

Alternative A

This alternative is essentially a continuation of current vegetation management with the notable exception that Minimum Management Requirements (MMR's) are included in the volume calculations and the use of an updated land base is used for suitable acres. Under this alternative, the Forest would manage about 508,800 suitable acres for timber harvest, and in the first decade, the total program sale quantity (merchantable plus unmerchantable volume) would be 316 million board feet. Timber offered for sale would be concentrated in the higher site Douglas fir types in the first decade where investment dollars returned on timber is highest. Older timber in areas planned for timber harvest under this alternative would be significantly reduced quickly and by the seventh decade, nearly all stands more than 150 years old and located inside intensive timber management areas would be converted into young, managed even-aged stands. In 150 years the Forest will support 65% as many trees over 150 years old as it now supports.

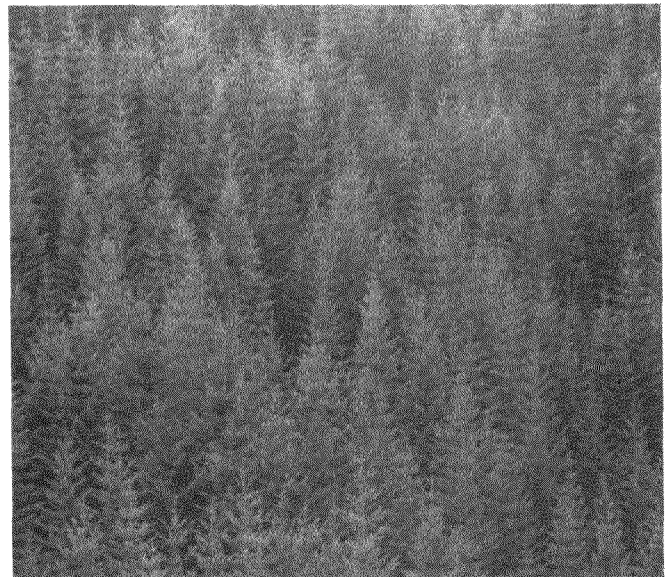
At this level of harvest, planting would average 4-5 thousand acres per year, mostly planted from nursery grown stock. Planted species would consist primarily of Douglas-fir, noble fir, and ponderosa pine, depending on site conditions. Brush species which compete with crop trees would be controlled.

Intensive levels of timber management would be maintained under this alternative for most riparian zones and their associated areas. About 5,000 acres of streamside riparian areas would be excluded from harvest due to unstable slopes. The character of two-thirds of the riparian vegetation would eventually show alteration. The diversity of vegetation by types and age classes, and streambank cover and stability would be reduced. These changes would be most visible in drainages of the Clackamas River and least visible in the Columbia and Bull Run drainages and The Dalles Watershed.

The overall character of vegetation effects produced under this alternative should be intensive vegetation treatment in the areas allocated to intensive timber management with many 10 to 40 acre stands of trees from 0 to 100 years old interspersed with an occasional stand of older trees. By the end of the 5th decade, these intensively managed timber areas would contain large acreages (around 200,000 acres, total) of trees 10 to 50 years old. These stands would be well stocked with conifers and the age and height variation within stands would be minimal.

Alternative B

This alternative provides for over 561,200 acres of tim-



Douglas-fir Plantation

ber available for regularly scheduled harvest. The total program sale quantity in the first decade would be 444 million board feet per year, with timber offered for sale concentrated in the higher site Douglas fir types. About 56,000 will be replanted during the first decade. This alternative reserves 98,350 acres to meet the habitat needs of wildlife such as the spotted owl, pileated woodpecker, and pine marten.

By the 6th decade, stands located inside intensive timber management areas that are over 150 years of age would be significantly reduced from first decade acres. A shift would take place in the seventh decade as significant acreage of timber stands would be reaching a commercial size. Emphasis would change from final harvest cutting to intermediate (commercial thinning) harvests.

The relatively unconstrained timber theme of this alternative allows relatively quick conversion to young plantations of fast growing trees. By the 5th decade much of the intensively managed timber areas would consist of 10 to 40 acre blocks of seedlings, saplings, and poles. However, forestwide, 150+ year old stands would be reduced to about 44% of their present amount.

The reforestation and stand treatment would be proportional to the acres entered by this alternative and an estimated 5,300 acres annually of planting, fertilizing, and release would be planned in each of the first two decades, jumping to over 12,000 acres in decade number 5.



Clearcut Harvest Unit

Alterations in the composition and structure of vegetation would be increasingly visible in riparian areas associated with seeps, springs, and intermittent streams throughout the Forest.

Under this alternative, overall effects of management activities would be characterized by intensive cutting of old growth in the first decade followed by a gradual decline to long-term sustained yield capacity in the fifth decade. Heavy cutting in the first decade would result in larger acreages (more than 100,000 acres) in small sawlog size timber by the fifth decade. Diversity of vegetation would be minimal in the understory since stocking control of the trees would not let large openings occur.

Alternative C

Of all ten alternatives, this one designates the second largest number of acres for timber harvest. Its 608,000 acres available for harvest represent 94% of the Forest's tentatively suitable land base. It calls for an average annual harvest in the first decade of 493 million board feet. The mixture of tree species would change, become fewer, and lean toward the more commercial tree species. This alternative would have one of the shortest average rotation lengths of any alternative.

All available unroaded areas will be entered and managed for maximum harvest rates, consistent with other intensively managed areas. In the intensive timber management areas, most of the available timber more than 150 years old would be cut by the end of the sixth decade. Forestwide, there would be about 46% as much of the area covered by trees greater than 150 years old as there is now.

Throughout the Forest, riparian areas associated with seeps, springs, and intermittent streams would show increasingly visible alteration in the composition and structure of their vegetation. These areas would support earlier successional stage vegetation, larger and more frequent openings, and more deciduous trees.

Within the intensively managed timber areas, age classes of trees would become very structured, and size classes would become smaller in diameter than trees grown in unmanaged stands. Ground vegetation would not be as diversified. Species of conifers would be determined mainly by what is planted or thinned out. An observer of the landscape would see many patches of even aged conifer plantations. Interspersed with these plantations would be areas of older trees in designated riparian zones and wildlife management areas.

Alternative D

This alternative has about 520,000 acres of Forest land available for harvesting. Of this, 42,000 acres would be harvested at an estimated 125-year rotation, and 110,000 acres at an estimated 250 year rotation. Annual first decade harvests would average 385 million board feet, and approximately 44,000 acres would be planted during the first decade. Wildlife habitat in pine/oak vegetation would be greatly decreased in the first decade.

Timber management in this alternative departs from even flow in the first 3 decades causing an immediate drop in the acres of stands from the intensive timber management areas in the 150-plus age group. (About 6,500 per year in period 1, 5,000 per year in period 2, and about 4,600 per year in period 3).

Riparian areas associated with seeps, springs, and intermittent streams within areas selected for intensive timber management would often have earlier successional

stage vegetation and larger and more frequent openings, as compared to most other alternatives.

As in any alternative, the overall characteristic of long rotation acreage (250 years, in this case, about 110,000 acres) would approach that of old growth insofar as understory vegetation and microclimates are concerned.

Alternative E

This alternative designates about 514,000 acres suitable and available for timber harvest. About 70% of the total acreage would be intensive management, and the other 30% managed under longer rotations. Under this alternative, harvesting would take place in nearly all species groups.

About 4,400 acres per year would be scheduled for reforestation by planting in the first decade. The diversity of other resource constraints along with the substantial target volume of this departure alternative makes it one of the most intensive modifiers of vegetation in timber stands available for harvest. It calls for a variety of techniques in vegetation manipulation in order to maximize yield from the available acres. The departure volume in the first few decades starting with 347 MMBF per year would require intensive management of available land. Such management would include planting genetically-improved seedlings, precommercial thinning, brush control, and a tendency to select harvest systems which yield the greatest volume, such as clearcut over shelterwood.

Alternative F

The emphasis of this alternative on roaded recreation and visual management can be seen in its reduction of acres to be harvested. Of the 488,000 acres available for harvest, trees on a majority of them would be grown to longer rotations approximating 125 and 250 years. These stands would occupy 220,000 and 154,000 acres respectively. This management would lead to stands with more acres of diversified age-classes, larger diameter trees, and more vegetation with old-growth characteristics. The understory will have more shade-tolerant species than would grow in comparable conditions of other alternatives.

Under this alternative, partial cuts and small clearcuts to meet the visual and roaded-recreation standards would be more common. This alternative would yield a low harvest in the associated species group.

Although approximately 35,000 acres will be replanted during the first decade, the role of planting would be declining in succeeding decades. Regeneration would be mostly through natural seeding. In sites where natural regeneration is spotty, sites would be planted. Some areas would have a superabundance of regeneration due to good seed years, favorable weather, or good

site conditions. This very abundance could cause stand stagnation and invite problems with disease, fire, and insects. The wide disparity in stand conditions found under a regime of natural regeneration would result in a variety of tree sizes, stand densities, and species composition. Stands produced by natural seeding tend to have comparatively low yields of usable wood but may have higher utility for wildlife.

Natural seedlings often establish a different mixture of species than if the area were planted. The amount of Douglas fir may decrease due to the encroachment of more shade tolerant species. Commercial thinning would be at low levels. The number of acres designated for precommercial thinning and fertilization would be lower than in other alternatives due to the low intensity of vegetation management. As a result, some areas would be overstocked and plantations would show slower growth. This alternative identifies an average first decade harvest of 239 MMBF per year, total.

The existing character and function of most riparian vegetation would be maintained or improved. Harvest which occurs in riparian areas would create small, patchy openings, a diversity of vegetative types and age-classes, and stable, well-vegetated stream banks.

Alterations in vegetation in this alternative would be generally at a low level, with correspondingly low levels of investment in artificial regeneration, fertilization, and precommercial thinning. Stand treatment would be non-intensive on the east side with very low per-year harvest from mixed conifer stands. Harvest levels would be half the Forest's current levels.

Alternative G

This alternative calls for timber management on 513,000 acres of suitable land base, which is about 79% of the total available. In the first decade, 46,000 acres would be harvested. The majority of these, 30,000 acres, would take place in west side old growth. By the end of the fifth decade, this cutting would reduce existing old-growth vegetation by 12%.

The alternative requires reduced rates of harvest from 78,200 acres of riparian areas adjacent to lakes, streams, wetlands, and their associated vegetation. An additional 34,900 acres of special watershed would be managed at longer rotations to benefit fish production and water quality. The Bull Run Watershed would be managed according to Public Law 95-200. Riparian areas associated with intermittent streams, seeps, and springs in areas where intensive timber management would take place will often have earlier successional stage vegetation.

The first decade average harvest would be about 307 MMBF per year. By the end of the fifth decade, about half the areas available for harvest would be zero to 50

years old. Planting would average 3,800 acres per year during the first decade. Natural regeneration would be a major addition to the planting program. The reliance on natural regeneration would no doubt result in abundant brush in various locations. Roughly 4,900 acres would be precommercially thinned annually under this alternative.

Alternative H

This alternative produces substantially different effects on vegetation than those resulting from most of the other proposals. Only 278,600 acres, less than half the possible maximum, would be designated suitable for timber management, as this alternative removes all old-growth and much of the steeper, unroaded areas from consideration as a timber resource. Planting in the first decade would be about 2,900 acres per year, and this rate would decline rapidly in later decades in favor of natural regeneration. Precommercial thinning in the first decade would total about 3,900 acres per year and this rate would also decline rapidly in later decades. Fertilization would not be utilized in the first decade, and would average about 500 acres per year in decades two through five. Long-term sustained yield capacity would be about a third of existing level. Low investment and nonintensive management prevail in timber management areas because this alternative does not emphasize timber production. Precommercial thinning, planting, and fertilization are low.

The high percentage of acres in extended rotations are necessary to meet this alternative's resource objectives. The total acreage in older stands actually increases over time.

This alternative affects or disturbs vegetation less than any other proposed plan. It would produce more acres of older stands and bigger trees than would any other alternative. Age-distribution would be spread more and species mixture greater than would be found in any other alternative. The growth rates of individual trees would be less without stocking control. The average harvest would be 108 MMBF per year during the first decade.

This alternative is unique in not allowing any identified stand now averaging 200 years old or more to be included in a chargeable harvest program. The result is that this alternative maximizes habitat for species dependent on old growth. The needs of these animal species are met further by eliminating chargeable harvest in unroaded areas.

Under this alternative, 236,000 acres would be managed for fish and water resources. Harvest of riparian areas would utilize small units so that patchy openings, a diversity of vegetative types and age classes, and stable, well-vegetated stream banks would result. Increases in early

successional stage vegetation, and the size and frequency of openings would occur in some intermittent stream riparian areas.

Alternative I

Alternative I represents a response to public issues that relate to maintenance and enhancement of fish and wildlife habitat with the result that all areas considered to be important components of these habitats would be managed primarily to meet these resource goals. This alternative also emphasizes visual quality and unroaded recreation opportunities to the maximum. Timber harvest would be eliminated in some areas designated for fish and wildlife management in order to develop maximum fish and wildlife habitat capability. In such areas, vegetation would be predominately mature and old growth with considerable riparian vegetation in stream-side locations.

The existing vegetative character of all kinds of riparian areas including streams, lakes, reservoirs, seeps, springs, and wetlands would be maintained or improved. Most riparian areas would progress naturally toward later successional stages. Throughout the Forest, diverse types of vegetation and age-classes would increasingly dominate the character of riparian growth.

To support species that depend on early successional vegetation, timber harvest on unrestricted acres would continue. These harvested acres would support grass and brush during the first decade or so after final harvest.

Although the total land base designated for timber management would be 426,000 acres, only 20% of this would be managed primarily for timber. Most of the timber lands would be cut at ages ranging from 125 to 250 years, with an average age at harvest of 150 years. This is a much older age for timber stands than would be found in a forest managed strictly for timber production. Vegetation under this type of management would appear much like an old-growth forest.

Harvest is well distributed across species working groups. About 2,800 acres would be planted per year in the first decade and about 4,400 acres of precommercial thinning would be done in the same time frame. Timber management under Alternative I would be characterized as nonintensive with most of the timber stands composed of older trees.

(3) Cumulative Effects of the Alternatives on Vegetation

(a) Old Growth Conifer Ecosystems

Old growth conifer forests are important for several reasons, as explained in "Natural Vegetation of Oregon and Washington" (Jerry F. Franklin and C. T. Dyrness, USDA Forest Service, General Technical Report PNW-8, 1973).

- Every coniferous genus finds its largest representative in the Northwest (*Abies*, *Picea*, *Psuedotsuga*, *Pinus*, *Chamaecyparis*, *Thuja*, *Sequoia*, *Larix*, and *Tsuga*).
- These forests represent the largest biomass accumulations in the temperate zone, and possibly the world.
- The size and longevity of the dominant species aggregate to form a unique forest ecosystem.

Mt. Hood National Forest contains only a small part of this ecosystem. If, however, old-growth acres on the Forest were to be reduced, the potentially cumulative effect on regional supplies of old growth could amount to an important loss. About 5% of presettlement old-growth acreage is now protected from timber harvest in National Parks, Wilderness, Research Natural Areas, and comparable set-asides. Concern about dwindling supplies of old growth focus upon three factors:

Evidence exists to show that large areas of old-growth habitat are needed to support viable populations of wildlife (spotted owls, etc.) which depend on old growth. Structural elements found in forests of old growth, such as large decaying logs, and the ecosystem functions these elements support, such as nutrient cycling, may be important in perpetuating productive forest systems.

Unique properties of this community may exist which are unknown at this time; therefore, the harvest of remaining old growth would eliminate the option to study such characteristics.

(4) Effects of the Alternatives on the Future Supply of Old Growth

(a) Old Growth Acreage

As noted at the bottom of Table III-9 (Chapter III), there are currently about 346,000 acres of old growth in the Forest, if old growth is defined as trees 200 years or older. Of this, about half is not in the land base of acres suitable for timber management under any alternative. Figure IV-10 shows that the maximum reduction in old growth in any alternative is slightly more than 50%.

Figure IV-10 shows that Alternatives NC, A and G would all retain about 80% of the existing amount of old growth after 50 years. The departure alternatives (B, C, D, and E) would retain less than 80% while the more amenities-oriented alternatives (F, H, and I) would retain more. Similar relationships pertain after 150 years.

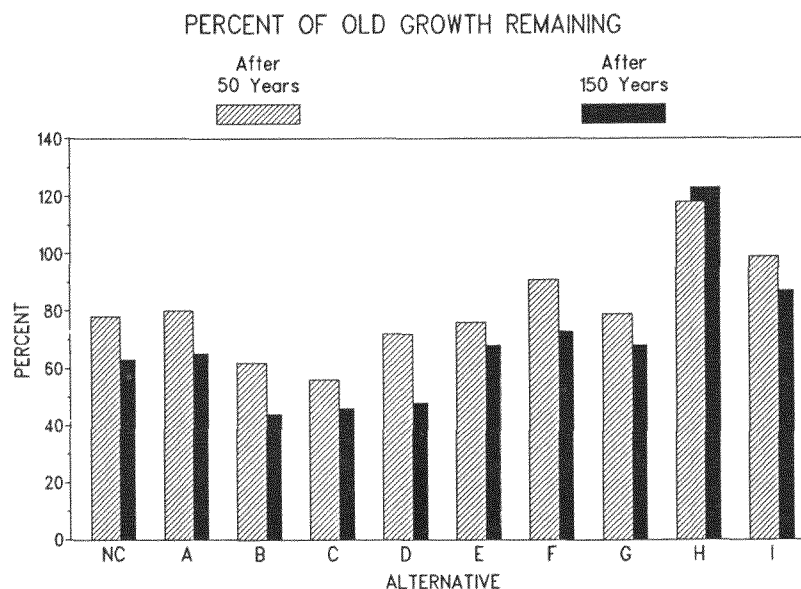
It is true that the NFMA minimum management requirements will protect some old growth in Alternatives A, B, and C. On the other hand, the large acreage of old growth that would be harvested in these alternatives contributes to the potential cumulative effect of reducing the old-growth ecosystems region-wide.

(b) Old Growth Wildlife Habitat

Most landowners in northwestern Oregon have already converted their old growth stands to young trees. The Mt. Hood National Forest contains some of the last stands of old growth in this part of the state. Old growth is unique as habitat for several species of wildlife. As described in the wildlife section of this chapter, reductions in this type of habitat would have potentially cumulative effects on species that depend on old growth. Alternatives B and C are most likely to bring about this effect.

If cattle graze in an area where trees are growing, they can trample seedlings and damage older trees by rub-

Figure IV-10



bing against them. This is most likely to happen where cattle congregate, as at watering areas or near shady places. However, the number of cattle on the Forest is so small that such damage would be insignificant. A more important effect might be realized if sheep were grazed on west side allotments. Sheep could aid in the control of undesirable brush and grasses by eating them.

(c) Riparian Vegetation

The good health of aquatic habitat on the Forest depends largely on the proper maintenance of stream-side vegetation. Both riparian and adjacent upland vegetation provide food, soil stabilization, and, possibly most important, shade. Where streams flow through both farmlands and forest land, the forested portions are sometimes critical in moderating water temperatures. Removing vegetation through timber harvest creates potentially cumulative effects on downstream fish habitat. Undesirable effects would be most likely to occur on Fifteenmile Creek and White River. Additional information on this subject is available in the Aquatic Resources section of this chapter.

(5) Conflicts Between the Effects of the Alternatives and Others' Plans and Policies for Vegetation

To one degree or another, all ten alternatives would conflict with the Oregon Department of Forestry's plans and policies for vegetation. Chapter II provides a detailed discussion of this problem under the sub-heading of "The 1980 Forestry Program For Oregon (FPFO)".

(6) Mitigation Measures For Vegetation

Mitigation of effects on vegetation includes those actions which mitigate the effects of human activities, such as timber harvest. In this sense, mitigation measures center around site preparation, planting, and other treatments designed to rapidly reforest harvested areas, and also to return such sites to their optimum productivity of wildlife habitats, visual quality, and other forest values. Many mitigation measures are common to all alternatives and vary only by the emphasis placed on them in managing any particular resource. However, mitigation measures vary considerably by the treatment of timber stands or vegetation and will therefore be reviewed by the type of stand involved.

(a) West Side Vegetation. Measures to mitigate the effects of timber harvest on vegetation in this type of forest center around the regeneration of commercial species and re-establishment of wildlife habitat after harvest. Both objectives are met if a prescribed amount of large woody debris and snags are left in harvest units. The presence of shade provided by such material enhances the health and productivity of planted and natural conifers. Some evidence exists to indicate that stand nutrient balance is also positively affected by the

presence of large woody debris. Habitat for wildlife is substantially more productive when these forest components are left in a harvested unit.

Precommercial and commercial thinning in themselves mitigate the absence of ground vegetation found in dense stands. By opening up the overstory and permitting sunlight to reach the forest floor, ground vegetation can flourish.

Burning in some west side harvest units can mitigate adverse vegetation effects by killing back brush species and preparing a seedbed (or plantable area for artificial regeneration) for conifers. In some situations, shelterwood harvest would be used to protect seedlings from initial extremes of temperature, drying wind, and sunlight. After seedlings become established, this overstory is removed. To revegetate west side stands, the basic tools of mitigation are site preparation, yarding of unmerchantable material (YUM), burning, hand-planting, and thinning.

The construction of fences, the seeding of desirable forage species, and the development of livestock watering areas would control livestock movement and mitigate impacts on range resources.

The effectiveness of these mitigation measures varies by site. Most of the techniques discussed have proven their effectiveness over decades and are backed by scientific studies. The use of hand planting allows the selection of proper species for each site, and enables us to control the timing of reforestation (Cleary, 1978) so as not to lose the site to brush invasion. Artificial shading has proven effective on harsh dry sites (Helgerson, 1985) in protecting seedlings from weather-related mortality. The use of fertilization on young Douglas fir stands on the west side has shown cubic-foot growth responses in the range of 7-22% over unfertilized stands (RFNRP Reports - U of W, 1986). Responses from fertilization continue to be measured 12 years after application.

(b) East Side Vegetation. For much of this area, mitigation measures are quite similar to those applied to the west side. Changes occur where sites are hotter and drier, or in some locations colder than on the west side. As a means of increasing the survival of seedlings, shelterwood and seed tree harvest methods may be combined with shade blocks (cardboard fastened to a stick) and microsite planting (planting behind stumps and logs rather than in rows). Revegetation is also a problem in frost pockets. Mitigation of these sites involves either planting frost-resistant conifers like spruce or white pine, or laying out units in such a way that cold air drains from the site.

Old logging practices have left tree species considered undesirable for economic or genetic reasons as seed trees in east side sites. Clearcutting and planting of

some of these sites will improve the overall health of the forest.

Broadcast burning is also used to prepare sites for planting or seeding. Underburning of litter and ground vegetation under carefully controlled conditions, usually prescribed in pole and sawlog size stands of Douglas fir, ponderosa pine, and larch, may also be used to prevent intense, stand-destroying wildfires, to recycle nutrients, to enhance wildlife habitat, and to control pests and diseases.

Some species of wildlife depend on the maintenance of ponderosa pine and oak trees in the pine/oak habitats along the Forest's eastern boundary. Mitigation of harvest effects on wildlife will consist of leaving a minimum number of large ponderosa pines per acre, and retaining the oak component of these stands.

The effectiveness of mitigation measures on the east side also varies by site and is similar to the effectiveness on the west side of the same techniques. The use of special planting techniques have improved survival on the east side - namely microsite planting (Cleary, 1978) and shade carding (Helgerson, 1985). Survival surveys on the Forest attribute a 10-15% increase in survival to these methods. Clearcuts that are made in frost pocket areas will not regenerate unless the proper species mix of frost tolerant species is used in planting (Edgren, 1986). Western white pine, Engelmann spruce, and lodgepole pine grow well in these frosty areas. The use of shelterwood harvest method has proven very effective on the east side in regenerating mixed conifer forests that would have harsh environmental conditions if clear-cut (Seidel, 1981). Seedling survival percentages increase dramatically when this harvest method is used.

(c) High Elevation Vegetation. Mitigation in these forests is mainly a matter of avoiding problems in the first place. Sites with frost pockets, late snowmelt, and extremely shallow soils can be avoided, since for the most part, they are not in the suitable base. Some sites are best suited to shelterwood or group selection methods. These harvest methods reduce temperature and moisture extremes with corresponding reduction of stress on seedlings. Natural seeding is frequently used in reforestation of high elevation sites because native gene pools are tailored to the specific conditions prevailing on the site.

Use of designated skid trails and other logging system controls can be used to mitigate scarring and defect in thin-barked trees found in high elevation zones. The effectiveness of mitigation measures in these high elevation sites is dramatic, and also necessary to maintain productivity. The use of natural regeneration is common under shelterwoods to maintain the local parentage that is adapted to the growing seasons in high elevations

(Franklin, 1972). Another mitigation measure used in assuring quick reforestation is fall planting. This is very effective in increasing seedling survival (Ellington, 1984) on sites where snowmelt does not occur until June of every year. On high elevation sites where Pacific silver fir is in the understory, the technique of utilizing the advanced regeneration after harvesting as a manageable crop is increasing. Most of these seedlings and saplings will release and grow (Herman, 1972) after the overstory is removed, and will supplement the stocking on the site, and provide for harsh microclimate relief.

(d) Riparian Vegetation. Location of clearcut units, roads, campgrounds, and other facilities away from streams is the most valuable method of mitigating their impacts on streamside vegetation. Timber harvest impacts can be reduced by marking trees to be left for riparian habitat structure. Log suspension during yarding and directional felling can reduce damage to streamside hardwoods such as alder and cottonwood. Measures to control grazing include adjustment of grazing periods, fencing, and reduction of total stock numbers.

Other mitigation measures in this zone would be to design harvest units which avoid blowdown adjacent to the unit. Keeping harvest units small, or perhaps using the group selection silvicultural system to maintain desired vegetation along a stream, are other mitigation measures. Planning for future harvest during initial entry would help with multiple entries and thereby mitigate potential damage to riparian resources.

The effectiveness of group selection and uneven-aged management harvest methods has not been widely proven, but they are desirable for aesthetic purposes, for maintaining continuous shade on a stream, for maintaining wildlife cover, or for maintaining trees as an evapotranspiration "pump" to keep the water table down (Oliver, 1987). It is known that only certain species can be managed successfully in an uneven-aged manner, and these only in certain situations. To be effective, the species will need rotation lengths compatible with surrounding upland areas to allow these areas to be thinned and harvested concurrently.

(7) Environmental Effects of Changes in Vegetation on Other Components of the Environment

Changes in vegetation affect virtually every other component of the Forest's environment. The presence or absence of wildlife depends primarily on the type of vegetation an area provides. The presence or absence of brush, hardwoods, and conifers in areas next to streams is usually critical to the quality and quantity of aquatic habitat and water quality. The visual quality of the Forest is tied closely to the appearance of its vegetation. Primary production of vegetation is vital to timber and

range-dependent sectors of the economy. Areas that people choose for recreation and what they do for recreation, are strongly correlated to the condition of the vegetation in recreation sites. Fuels consist of live and dead vegetation, and its condition is therefore a critical factor in the start and spread of forest fires. Sections in this chapter on wildlife, aquatic habitat, visual quality, range, timber, recreation, and fire provide extensive additional information on these subjects.

e. Effects of Alternative Activities on Aquatic Resources

Introduction

The impacts of management activities are assessed on two major aquatic resources: fish habitat and water quality. These resources, frequently referred to as "riparian-dependent" resources, are strongly affected by management of, and conditions within, adjacent riparian areas, as reported by Meehan, et. al., 1977; Chamberlin, 1982; Bottom, et. al., 198; and others. These systems and their allied resources are generally thought of as being adapted over long periods of time to a given range of variations in natural conditions. Environmental disturbances like floods, fires, windstorms, and severe drought cause the most important variations. Such events typically cause local and/or relatively temporary changes in fish habitat and water quality by modifying the characteristics of riparian areas and aquatic habitats.

Forest management activities, especially those involving major modifications of riparian areas or aquatic habitats, can have major effects on fish habitat and water quality. As brought out in Chapter III of this document, under the heading "Interactions," the extent and duration of these effects depend mainly on the frequency, magnitude, and geographic coverage of management activities. These activities impose an additional level of effects over and above those caused by natural disturbances. Resource management practices can often produce adverse effects on fish habitat and water quality unless they are carefully planned and carried out to improve specific aquatic resources.

A simple model is used to analyze the effects of management activities on fish and water resources. The model integrates four major variables:

1. Accelerated delivery of sediment to aquatic ecosystems.
2. A weighted total of acres assigned to one of three riparian management strategies. Key Site Riparian acres are weighted (2), Special Emphasis acres are weighted (0.5), and General Riparian acreages are weighted (1.0).
3. Acres of other land allocations having high compatibility with riparian area management objectives.

4. A measure of relative watershed conditions reflected by the percentage of acres in the zero to 30-year vegetation age class in any decade.

The relative weights assigned to each variable were based on its estimated accuracy and its comparative importance in controlling future aquatic ecosystem conditions. The model measures future aquatic ecosystem stability on a scale from zero, the least stable, to ten, the most stable. The model was used to evaluate each alternative on a Forest-wide and a specific drainage scale. Specific drainages were analyzed to identify areas with conditions substantially better or worse than those contained in the Forest's average. The goal of the model is to reflect the cumulative effects of an array of land allocations and management activities, primarily timber harvest and road building, on the aquatic ecosystem over time. Most effects result indirectly from activities that can modify physical and biological characteristics of aquatic ecosystems. Physical characteristics of the systems include water quality, habitat complexity, channel stability, and watershed conditions. Biological characteristics include the composition of vegetation, and the structure and diversity of the riparian area. Cumulative effects are examined primarily within the context of the Forest land base.

Extrapolations were drawn from basic, total model scores to estimate long-term trends (50 years) in aquatic conditions and "extreme event" changes in overall conditions at the end of that time period. Extrapolations assume "major" changes will be created by severe environmental disturbances such as windstorms or floods which have a predictable probability of occurring over a 50-year span.

Reported conditions for aquatic stability, long-term trend and "extreme event" occurrences assume that a variety of mitigation and rehabilitation measures would be routinely funded and applied on a timely basis. If these measures are inadequately funded, poorly designed, or incompletely applied, conditions of aquatic resources would be worse than described.

The Aquatic Habitat Condition Model and extrapolations from it such as Smolt Habitat and Legal Trout Habitat Capability must be used with care. The model has not been field validated. It requires numerous assumptions including the four major variables used as the most powerful and available predictors of future aquatic habitat conditions. In spite of the fact that basin-wide, long-term modeling now involves high levels of uncertainty, it remains the most objective, standardized process for comparing trends in fish habitat and water quality between alternatives. All results should be used as providing a relative index or indicator of trends for the factors under consideration, such as Aquatic Habitat Stability,

Smolt/Legal Trout Habitat Capability, or Watershed Conditions.

(1) Direct Effects of Alternative Activities on Aquatic Resources

Table IV-3 compares the aquatic effects of alternatives. Stability describes the relative resistance of aquatic habitat to major losses in productive capability, given a normal level of natural disturbances such as windstorms, fires, and floods. An increasing diversity of riparian and aquatic micro-habitats within a given analysis implies a higher stability rating. Extreme event trends predict aquatic habitat capability after extreme disturbances with 30% or less probability of occurrence in 50 years. For example the probability of two 100-year floods occurring in 50 years is 25%. Trends assume full implementation and maintenance of rehabilitation structures.

Long-term (5 decades), Forest-wide aquatic habitat capability will likely decline. The degree will be controlled largely by the incidence of large episodic events such as floods, earthflow movements, etc. Such events, coupled with the increasingly altered condition of riparian areas will cause reductions in stream channel stability and complexity of aquatic habitat and increased sediment loads and summer stream temperatures. Reductions in fish habitat capability, coupled with a general increase in recreation demand, may require increased plantings of hatchery raised trout and anadromous fish by Oregon Department of Fish and Wildlife.

Rather large investments will be required to partially rehabilitate riparian and aquatic areas most significantly affected by timber and road building activities. Due to overall reductions in watershed condition and aquatic habitat stability the efficiency and durability of these

Table IV-3

AQUATIC EFFECTS BY ALTERNATIVE

Forest Wide Summary

ALTERNATIVE	AQUATIC HABITAT STABILITY		LONG TERM TRENDS (See note)	EXTREME EVENT TRENDS (See note)
	INDEX	Decades 1 and 2 RATING	Decades 1 to 5	Decades 1 to 5
NC	0.9	Very Low	Declining	Declining
A	3.3	Low-Moderate	Stable	Stable-Declining
B	1.3	Very Low-Low	Stable	Declining
C	1.2	Very Low-Low	Stable	Declining
D	2.7	Low	Stable	Stable-Declining
E	3.5	Moderate-Low	Stable-Improving	Stable
F	8.0	High	Improving	Improving
G	3.8	Moderate	Stable-Improving	Stable
H	7.9	High	Improving	Improving
I	9.2	Very High	Improving	Improving

Alternative NC

Alternative NC provides no positive provisions for riparian area management other than excluding timber harvest on about 5,000 acres of unstable stream-adjacent slopes. As a result, land and vegetation disturbing activities will occur within the majority of riparian areas on the Forest. Full intensity timber management will occur, unless a particular riparian area is included in a management area other than timber emphasis.

Near term results (decades 1-2) will result in very low to low stability of the aquatic habitat. Relative adverse effects associated with episodic events such as flooding, will be increased and the ability of aquatic systems to recover will be reduced Forest-wide.

measures are likely to be reduced. Maintenance and replacement costs will occur rapidly as the number of rehabilitated sites increase.

Alternative A

The incorporation of minimum management requirements in this alternative substantially alleviates concerns about future reductions in riparian resource conditions. Current plans provide minimal management emphasis for riparian areas and dependent resources. Minimum management requirements include the explicit application of riparian management emphasis to approximately 75,700 acres. Included are riparian areas associated with perennial and fish-bearing streams, lakes, reservoirs, and wetlands. In addition, the Bull Run Watershed is managed to maintain riparian resources as a necessary

adjunct to the goal of providing high quality water to the City of Portland.

In the short term (decades 1-2) aquatic habitat stability is rated as low to moderate. Relative to other alternatives, amounts of harvest disturbance, increased sedimentation and extent of other riparian-compatible allocations are in the mid-range - more favorable than alternatives such as B and C, and less than alternatives such as F, H, and I. Fish habitat capability would be maintained at about existing levels assuming "average" levels of natural disturbance, full implementation of mitigation measures, and a moderately aggressive program of watershed and aquatic habitat rehabilitation.

Long term aquatic habitat capability is estimated as stable. Even assuming extreme environmental events (episodic floods, blow down, etc.) aquatic habitat trends are rated as stable to slightly declining. The frequency and magnitude of these large scale events will control the ultimate direction of this trend.

Variations from "average" Forest-wide aquatic conditions are noted in five of fifteen drainages. Substantially better aquatic and riparian resource conditions are estimated in the Columbia, Bull Run, and Salmon River drainages. The opposite is projected for the Upper Clackamas and Hot Springs drainages. Combined downstream effects are possible from these two drainages. The most likely is increased sedimentation reflected through more frequent and persistent periods of high turbidity.

Variations from average aquatic habitat conditions Forest-wide develop in two geographic areas. The Columbia and Bull Run drainages would substantially exceed average conditions Forest-wide. However, four of the six drainages which make up the Clackamas River basin would reflect conditions more severe than those averaged Forest-wide. This situation could lead to greater reductions in habitat capability on Clackamas tributaries as well as reduced water quality on the mainstream Clackamas within and immediately adjacent to the Forest. Reduced aquatic capability and lower water quality would reduce fishing opportunities especially in the spring and fall. Holding and rearing habitat for spring chinook salmon, and holding habitat for summer steelhead on the mainstream of the Clackamas and Collawash Rivers may be reduced.

Alternative B

Aquatic habitat stability under this alternative is rated low to very low over the short term. Riparian areas totalling 75,700 acres would be explicitly allocated for riparian management at the minimum management level. In addition, the Bull Run Watershed is managed for watershed protection in accordance with Public Law 95-200.

Short term benefits of the riparian allocations would be offset by relatively high levels of timber harvest, roading, increased sedimentation, and generally low levels of other riparian-compatible allocations. Habitat capability would likely be maintained at existing levels given average levels of natural disturbances such as floods, fire, and windstorms, provided also that an aggressive rehabilitation program would be applied.

Long term, aquatic habitat capability would remain stable. Aquatic system resiliency provided by riparian allocations would be sufficient to maintain aquatic habitat capability provided environmental conditions remain normal and large investments are made to rehabilitate riparian areas and aquatic resources. Extreme event conditions, however, would be likely to cause a decline in aquatic capability Forest-wide over the long term. The degree and extent of such a decline would depend on the nature and frequency of episodic events and the long term success of rehabilitation efforts.

Major variations from Forest-wide aquatic conditions are indicated in eight of fifteen drainages. Generally better conditions are projected for the Columbia, Bull Run, and Salmon River drainages. Substantially worse conditions are projected for the White River drainage and four of six Clackamas River drainages: Oak Grove, Hot Springs, Fish Creek, and the Collawash. This combination would be likely to affect the upper mainstem Clackamas and lower portions of major tributaries similarly to the effects described for Alternative A.

Alternative C

In the short term, this alternative's activities would effect the aquatic systems of the Forest outside the Bull Run similarly to those described for Alternative B. Major controlling factors are relatively high levels of timber harvest, roading, and generally low levels of riparian-compatible land allocations.

Aquatic habitat capability would remain stable at current levels provided environmental conditions remain average, rehabilitation measures are extensive, and compliance with minimum management requirements would provide the resiliency to recover from disturbances. Short term changes to environmental conditions due to periodic events such as moderate floods (10-year) are likely to occur.

This alternative is the only one that calls for intensive timber management in the Bull Run. Timber harvesting in the Bull Run would require more mitigation than presently indicated, including the possibility of a new water filtration plant to assure water quality.

The Forest's primary objective for Bull Run is to maintain its exceptionally high quality of untreated water currently consumed by nearly 40% of Oregon's population.

Water quality is now maintained by complying with the "Water Quality Standards For Bull Run Watershed Management Unit in accordance with Bull Run Law PL 95-200, the Bull Run Unit Plan," and ongoing monitoring, agreements, and notations with Portland city and Bull Run Advisory Board representatives. Under this alternative, the risk of violating these standards would increase.

Alternative D

This alternative increases the extent of riparian management areas by 25,500 acres above the minimum management requirement level by adding 15 Key Site Riparian Habitat Management Areas and a Special Emphasis-Watershed Area -- the Miles Creek drainage which includes Fifteenmile Creek, its tributaries, and the South Fork Mill Creek. This Special Emphasis area calls for more effective management of a depressed but resilient run of wild winter steelhead, and municipal water sources for the Dalles and Dufur.

In the short term, the Forest's aquatic system would improve slightly in comparison to Alternatives NC, B and C. Aquatic stability would be rated low. Current habitat capability would be maintained at existing levels provided environmental conditions remain average and annual investments in rehabilitation are moderate to high. Associated costs of maintenance would increase substantially in the short term and then remain roughly constant because little or no backlog work would be likely to remain. Benefits from increased emphasis on riparian areas would be offset in part by accelerated harvest rates and accelerated sediment delivery in the first and second decades.

Trends in aquatic conditions over the long term are estimated as stable, however, minor declines may occur Forest-wide. The magnitude of any such decline would be controlled largely by the relative success and durability of mitigation measures, and the magnitude and frequency of episodic natural disturbances like floods and fires.

Major variations from Forest-wide aquatic conditions are projected in seven of the fifteen drainages. Substantially improved trends are likely in the Columbia, Bull Run, Salmon River, and Lower Clackamas drainages. The opposite is projected for the Upper Clackamas, Oak Grove, and White River drainages. Worse conditions in those drainages may produce accentuated combined effects that reduce aquatic conditions on the upper and mid-mainstem Clackamas and its major tributaries. Increased summer stream temperatures would be likely in the White River drainage off the Forest. This could further reduce habitat capability for resident fish populations.

Alternative E

This alternative provides moderate to substantial improvements to riparian area and aquatic habitat management above base levels represented in Alternatives NC, B and C. It explicitly manages 37,400 acres for riparian management in addition to 90,600 acres within the Bull Run and 75,700 acres of riparian minimum management requirements. The 37,400 acres includes the addition of 15 Key Site Riparian areas and two Special Emphasis areas: Miles Creek drainage and Still Creek watershed. Additional riparian benefits result from compatible management emphasis on relatively high amounts of other land. Moderate levels of aquatic habitat rehabilitation and enhancement are also provided.

In the short term, aquatic habitat stability is rated moderate to low. If environmental conditions remain average, and planned rehabilitation and enhancement investments are made, increases from 5 to 10% in the Forest's aquatic habitat capability may be anticipated by the second decade.

Long term, the trends in aquatic habitat are rated stable to slightly improving. This trend could well be improved based upon success in meeting operational standards and the efficiency and durability of rehabilitation/enhancement measures.

If environmental events were extreme, trends in aquatic habitat conditions would become stable to slightly declining. The frequency and magnitude of large scale environmental disturbances would likely influence the ultimate direction of this trend.

Variations from average aquatic conditions Forest-wide occur in eight of fifteen drainages. Substantially better conditions are projected in Columbia, Bull Run, Salmon, and Lower Clackamas drainages. Less than average conditions are projected in Badger/Jordan, White River, Oak Grove, and Upper Clackamas drainages. Slight reductions in rearing areas for resident trout off the Forest due to increased stream temperatures would be possible in the White River drainage. Similarly minor reductions are possible on the upper mainstem Clackamas and associated upper basin tributaries.

Alternative F

This alternative provides major and positive opportunities for aquatic habitat management. It calls for more major increases in the number and acreage of areas emphasizing riparian management, as well as other compatible management activities, than any other alternative except H and I. It includes about 64% of the total possible acres for riparian management. Above the base level, this alternative adds more than 50 Key Site Riparian areas, 20 Special Emphasis areas, and adds seeps and springs to the general riparian category.

In the short term, aquatic stability would be rated high. General improvement in aquatic conditions is projected through natural recovery of previously disturbed areas. Additional improvements would occur through annual investments for both habitat rehabilitation and enhancement.

Long term, the trends in aquatic conditions would show general improvement across the entire Forest. Major factors would include natural recovery of previously disturbed areas, rehabilitation and enhancement, and a high percentage of complementary land allocations. Even if extreme event conditions were to occur, improving aquatic trends would be expected to persist.

Alternative G

Over the short term, this alternative's effects on aquatic habitat Forest-wide would be similar to those discussed for Alternative D except for slight improvements. Overall aquatic stability is rated low. Riparian management is the same as for Alternative E. Additions above the minimum management requirement level include 15 Key Site Riparian areas and two Special Emphasis Watershed areas: Miles Creek drainage and the Still Creek watershed in the Sandy River drainage. Relative improvements also derive from generally high levels of riparian-compatible allocations, moderate levels of harvest acreage, and only moderately accelerated sediment delivery. Assuming average environmental conditions and a moderate annual investment in rehabilitation and enhancement habitat capability would be maintained or slightly improved.

Long term, the trends for aquatic habitat are projected to be stable to slightly improving due to rehabilitation and enhancement. Conditions resulting from extreme environmental events would produce unchanged to slightly declining trends in aquatic habitat stability. Long term trends would be strongly influenced by three factors: (1) operational efficiency in meeting riparian standards, (2) success in rehabilitation and enhancement, and (3) the frequency and magnitude of large-scale environmental disturbances.

Nine of fifteen drainages would vary from general Forest-wide conditions. Substantially better conditions are projected for the Columbia, Bull Run, Salmon River, and three of six Clackamas River drainages. Poorer than average habitat conditions are projected for Sandy River, White River, and Oak Grove drainages. Even in the latter areas, however, aquatic stability would remain moderate and long term trends stable to improving.

Alternative H

This alternative provides management opportunities for riparian areas and aquatic habitat management similar to those discussed for Alternative F. Relatively large

amounts of land, 88,800 acres in addition to the Bull Run and MMR's would be explicitly allocated for riparian objectives. The 88,800 acres include 24 Key Site Riparian areas, 8 Special Emphasis areas, and seeps and springs. High levels of riparian-compatible allocations are also incorporated.

Existing old-growth habitat conditions would be preserved in riparian areas. This alternative's short term aquatic stability would be rated high. Relative levels of timber harvest and accelerated sediment delivery would be lower than any alternative except I. Under average environmental conditions, this alternative projects general improvements in aquatic habitat conditions and habitat capability.

Long term, the trends show general improvement in aquatic conditions throughout the Forest. Contributing factors were discussed in Alternative F. Given extreme event conditions, improving trends would continue although at somewhat reduced levels. Variations from the Forest's average aquatic conditions are projected for nine of fifteen drainages. Substantially better conditions would be found in Columbia, Bull Run, and Salmon River drainages. Relatively worse conditions would be likely in Miles Creek, Badger/Jordan, White River, Lower Clackamas, Hot Springs Fork, and the Collawash. Even in these six drainages, however, short term aquatic stability would rate as moderate, and long term trends would be stable to improving.

Alternative I

This alternative includes the maximum possible acreage, 284,800 acres, including MMR's and the Bull Run, designated for riparian-area management, and provides more emphasis on riparian area/aquatic habitat management than any other alternative. It incorporates about 50 Key Site Riparian areas, 39 Special Emphasis areas, and all remaining riparian types of land in the General Riparian Management Area. Nearly 80% of the remaining acres receive riparian-compatible management. High levels of investment would eliminate the Forest's backlog of rehabilitation and fully implement the aquatic enhancement program. Substantial increases in smolt and legal trout habitat capability would become evident by the second decade and persist through the analysis period.

In the short term, aquatic stability rates very high. Under average conditions, previously disturbed areas would recover quite rapidly and conditions would improve at corresponding rates. Investments in rehabilitation and habitat enhancement would improve watershed conditions and habitat capability.

Long term trends in aquatic conditions would show substantial improvement. Total increases in habitat capability are likely to exceed 15% throughout the Forest. Trends across the Forest, if subjected to ex-

treme environmental disturbances, would nevertheless continue to improve. This relates to the projected high stability and resiliency of the riparian-aquatic system.

Nine of fifteen drainages would deviate from general aquatic conditions prevailing throughout the Forest. Most would show substantially better conditions, including Columbia, Bull Run, Salmon River, Lower Clackamas, Fish Creek, Hot Springs Fork, and Collowash. Conditions worse than average would be found on the Oak Grove Fork and Upper Clackamas drainages. On these two drainages, this would imply a short term aquatic stability rating of high/stable to slightly improving long term trends.

(2) Cumulative Effects of the Alternatives on Aquatic Resources

Background

This discussion of the alternatives' impacts on aquatic habitats incorporates a number of variables as a method of estimating future habitat trends and conditions. The process has been designed to describe cumulative effects to aquatic habitats on the Forest. This level of analysis appears adequate for most of the Forest's river basins and drainages based on professional judgement that identifiable, off-the-Forest effects would not be felt in most areas. Two river basins, however, cannot be included in that level of analysis. These are Fifteenmile Creek and White River. Climate and the uses of land in these two areas create special conditions in which water quality and fish habitat off the Forest could be sensitive to Forest management activities.

(a) Fifteenmile Creek is a direct tributary of the Columbia River. Roughly 60 to 70 percent of the drainage is privately owned and used primarily for dry land wheat production. This basin supports the westernmost run of wild winter steelhead trout in Oregon. The run is at severely depressed levels due to reductions in available rearing habitat. The cause of such reductions appears to be a combination of lethally warm water temperatures in the summer, excessive sedimentation, and severely reduced summer stream flows. A limited portion of the total basin on or immediately adjacent to the Forest appears to be the primary source of existing steelhead reproduction and growth. Suitable habitat conditions exist in this area and they are believed strongly linked to the generally favorable water quality associated with the Forest's streams. If water quality or habitat were to be reduced on the Forest, the likely result would be unusually large, adverse effects on water quality and steelhead habitat off-the-Forest.

(b) The White River is a direct tributary of the Deschutes River. About 60% of its drainage is in public ownership, and the majority of this holding is in lands of the National Forest System. Privately owned lands are

used mainly to support livestock, dry land and irrigated farming, and timber production. Irrigation from up-river tributaries supports much of the agricultural activity.

Most of the larger streams in this basin support populations of resident trout. At least three unique specimens of wild rainbow trout are found in these waters. The White River Feasibility Report, 1985, states that anadromous fisheries could be introduced into the basin without negative effects on resident fish.

Water quality in the upper basin is generally good. Periodically, however, high levels of suspended sediment are delivered into the White River mainstem due to glacial melt. Conditions in the lower mainstem and its major tributaries, Rock Creek, Threemile, Badger, and Tygh Creek, show very high summer stream temperatures reaching to 25 degrees C (77 degrees F), often accompanied by increased sedimentation. These adverse conditions appear to be intensified by up-stream irrigation which reduces the main streamflows. Changes in up-stream water quality are likely to further aggravate existing problems downstream. Available rearing areas and actual basin production for resident trout or anadromous species may be severely endangered.

(c) Assessments of cumulative downstream effects are based on continuation of known land use practices on all lands other than the National Forest. Plans for comprehensive habitat restoration have been approved for Fifteenmile Creek and are possible on White River as part of the Northwest Power Planning Council's Columbia Basin Fish and Wildlife Program, but details of the extent and probable effectiveness of this work are not known at this time.

In general, increased stream temperatures and sedimentation are the main sources of off-the-Forest changes in water quality and fish habitat. These changes could be within acceptable limits on the Forest, if present conditions are assumed to continue, but they could also result in increase in streams with unacceptable conditions for fish off the Forest. This risk is associated with all ten alternatives although its probability would vary substantially between basins by alternative and by time spans. Table IV-4 shows the relative risks of downstream cumulative effects by alternatives and short or long time periods.

In some areas, cattle will damage stream banks by trampling and breaking down the banks. Stream temperatures could increase due to bank slippage and cropping streamside vegetation.

The habits of cattle would cause a problem with water quality. Their manure would enter the water causing an increased demand for biological oxygen. Oxygen needed by aquatic animals, including fish, would be reduced because it would be used to break down the cattle's or-

ganic material. Trout are especially sensitive to any decrease in oxygen levels in the water. Considering the Forest on the whole, however, and granting that water quality may be adversely affected in streams flowing through grazing allotments, riparian areas, water quality, and fisheries would not be greatly affected by grazing.

diminished by basin-wide hydroelectric development and operation. Restoration provisions include protecting fish survival, encouraging their reproduction, and rehabilitating and enhancing their habitats in the Columbia River and its tributaries.

Table IV-4
Relative Risk Ratings for Cumulative Effects Upon
Water Quality and Fish Habitat for Off-Forest Locations
Probability of Off-Forest Effects

ALTER-NATIVE	TIME PERIOD		FIFTEENMILE BASIN	WHITE RIVER BASIN	
	SHORT	LONG	MILES CREEK DRAINAGE	BADGER/JORDAN DRAINAGE	WHITE RIVER DRAINAGE
NC	X		H	H	H
A	X	X	H	H	H
B	X	X	H	H	H
C	X	X	H	H	H
D	X	X	L	M	H-M
G	X	X	L	M	M-H
E	X	X	L	M	H-M
F	X	X	L	M	H-M
H	X	X	L	L	M
I	X		L	M-L	M-L

LEGEND: H = high probability M = medium probability L = low probability

(3) Conflicts Between the Effects of the Alternatives and Others' Plans and Policies for Aquatic Resources

There are a number of plans and policies formulated by other parties with regard to the management of the aquatic habitat. Most of these plans and policies have elements that deal specifically with fish habitats. In general, they address two basic elements of fish habitat:

1. The maintenance of existing habitat.
2. The restoration, rehabilitation, and/or enhancement of fish habitat.

Four pertinent plans or programs are:

A. The Columbia River Basin Fish and Wildlife Program, 1984, (Northwest Power Planning Council). This plan was prompted by passage of the Pacific Northwest Electric Power Planning and Conservation Act of 1980 (P.L. 95-501). This plan emphasizes the restoration of Columbia River anadromous fish runs

B. Comprehensive Plan for Production and Management of Oregon's Anadromous Salmon and Trout, 1982 (Oregon Dept. of Fish and Wildlife). This statewide plan deals with all major anadromous species. Habitat management considerations focus on the maintenance and improvement of anadromous fish habitat.

C. Oregon Wild Fish Policy (Oregon Dept. of Fish and Wildlife). This policy formally recognizes the need for habitat-based, wild, and natural fisheries production.

D. Willamette Basin Fish Management Plan, 1980 (Oregon Dept. of Fish and Wildlife). A key feature of this plan is a section that emphasizes the importance of maintaining fish habitat to insure fish populations remain at high levels. This plan is currently being updated.

All alternatives, except NC, indicate general maintenance of the Forest's aquatic habitat and therefore appear to be generally consistent with such goals. In Alter-

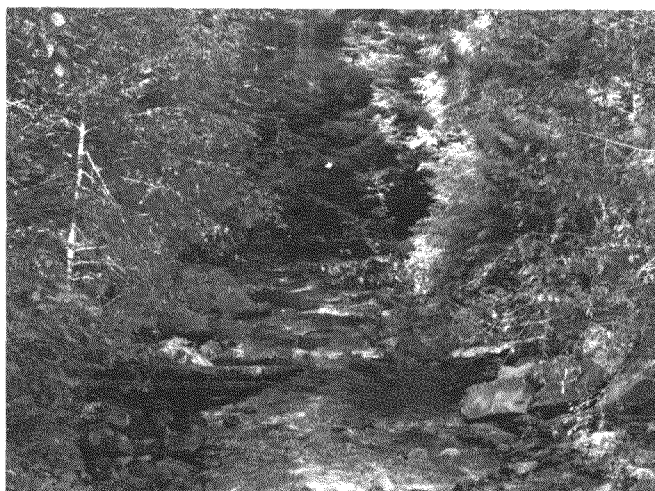
native NC, declines in aquatic habitat capability are projected in both short and long-term time periods. Any such decline appears inconsistent with the aforementioned plans/programs.

Proposed rehabilitation and restoration efforts center primarily on maintaining existing production capability levels of the habitat. Alternatives B, C, and D fall into this category. Alternatives E, G, F, H, and I project future increases from current levels in the production capabilities of Forest aquatic habitat. These alternatives are therefore fully consistent with the identified plans and programs. In this group of alternatives, E would produce the least substantial increases.

(4) Mitigation Measures

The three mitigation measures of greatest significance are:

- Specific management direction for riparian-dependent resource management.
- Forest-wide standards and guidelines for fish, water, and riparian resources.
- An array of rehabilitation and/or enhancement techniques.



Creation of pool habitat using anchored logs

These measures are incorporated in various combinations depending on the theme of a particular alternative. Minimum management requirements provide general riparian management of all Class I, II and III streams, lakes, reservoirs and wetlands. In addition, important Key Site Riparian Habitat management areas are located on the mainstems of Fifteenmile Creek (lower,) White River (upper), Badger Creek (lower), Boulder Creek (upper), Gate Creek (lower), and Clear Creek (upper) in every alternative but NC.

As a general rule, alternatives with the lowest relative acreage in riparian management areas (i.e., B, C, and D) include the highest levels of riparian rehabilitation. Al-

ternatives with the highest riparian management levels (i.e., A, G, E, F, H, and I) will employ rehabilitation measures as well as increasing measures for enhancement. Alternatives A, D, F, G, and E, H and I apply Special Emphasis riparian management to the entire Miles Creek drainage. This emphasis is to facilitate positive management of riparian-dependent resources such as water and fish. Alternatives F, H, and I apply Special Emphasis riparian management to selected streams in the White River basin. Additional Key Site Riparian allocations are incorporated in both Fifteenmile Creek and White River basins.

Mitigation can be used to reduce effects of disturbing activities on riparian areas and aquatic habitats. Two general groups of measures have been recognized:

1. Measures or operational practices applied during project planning and/or implementation to reduce undesired impacts.
2. Post-project activities designed to accelerate restoration of desired habitat conditions or attributes.

Since the measures in the first group are designed to avoid unnecessary levels of disturbance, they receive the highest priority. When they are applied successfully, they reduce or avoid the need for post-project investments to repair the damage or rehabilitate the resource. Many of these practices are described in the accompanying Table IV-5 which summarizes some of the most common measures by major resource management area.

Fencing is very effective in mitigating impacts from livestock grazing. The achievement of uniform distribution of livestock has good results as a method of mitigating impacts to riparian areas.

Measures in the second group include projects designed to restore or speed restoration of desired riparian and/or aquatic habitat conditions. These projects usually require added costs for reconnaissance, planning, implementation, and maintenance. Frequently they attempt to mimic natural conditions and therefore require different periods of time (one to ten years) to reach full effectiveness. The long term efficiency and durability of common rehabilitation applications (15 to 30 years) have not been fully evaluated for conditions found on the forest. Monitoring individual projects over limited time, such as one to five years, indicates generally good success, that is, more than 70% accuracy. Costs vary by type of treatment, intensity and access and range on average \$5,000 to \$40,000 per treated mile of stream. Conditions commonly encountered and measures to mitigate them are summarized in Table IV-6.

Table IV-5

Measures Commonly Applied During Project Planning and Implementation to Mitigate Riparian Area Effects Related to Selected Management Activities

RESOURCE MANAGEMENT ACTIVITY	COMMON MITIGATION MEASURES
Recreation	<ol style="list-style-type: none"> 1. Project location/design to avoid "special habitats". 2. Access control to limit overuse. 3. Closure of individual sites to allow recovery. 4. Information signing.
Range	<ol style="list-style-type: none"> 1. Adjustment of grazing periods. 2. Adjustment of grazing numbers. 3. Access control (fencing, water development).
Timber & Road Construction	<ol style="list-style-type: none"> 1. Road and unit location and design to avoid sensitive areas. 2. Special marking to maintain desired tree species or riparian/aquatic structure. 3. Directional falling. 4. Log suspension during yarding. 5. Special road drainage design. 6. Temporary road use. 7. Reforestation/silvicultural treatment to create desired tree species/structural character.

Table IV-6

Measures Commonly Used to Rehabilitate Riparian or Aquatic Resources

CONDITION TO REHABILITATE	NONSTRUCTURAL MEASURES	STRUCTURAL MEASURES
Riparian Habitat	Vegetation planting Removal of selected vegetation Underburning	Excavate ponds, channels Road/trail gating/closure Nest boxes
Channel Structure/ Aquatic Habitat Complexity	Introductions of large woody debris Gravel placement Removal of fills constricting channel Vegetation planting	Log sills, deflectors, wings Gabion installation Boulder placement Pond/side channel development Lake outlet control Large woody material placement Bank stabilization (riprap, etc.)
Exposed/Compacted Soils	Vegetation planting Ripping/scarification Mulching	Special drainage structure Water bars Check dams Fencing Ripping and revegetation
Fish Passage	Remove Blockage	Fish ladder Baffles Jump pools Log jam modification

(5) Mitigation Measures by Alternative

Alternative NC

To mitigate reductions in aquatic habitat capability under this alternative, rehabilitation investments from \$500,000 to \$700,000 per year would be scheduled. During decades two to four, aquatic habitat stability would be reduced on increasing areas of the Forest. Due to a variety of factors (site access, watershed condition, maintenance requirements) the durability and effectiveness of individual measures will be reduced relative to other alternatives. The backlog of needed rehabilitation projects will continue to increase. Maintenance requirements will increase rapidly in the 1st decade and remain at high levels thereafter.

Alternative A

The estimated investment in rehabilitation for this alternative is \$300,000.00 to \$500,000.00 per year. These measures if implemented and maintained on a timely basis should retain existing aquatic habitat capability throughout the Forest.

Alternative B

Mitigation of adverse effects on aquatic resources would be centered on in-stream protection in class I, II, and III streams as well as lakes and reservoirs. The estimated investment in riparian area aquatic habitat rehabilitation would be about \$600,000.00 per year. This would allow treatment of newly created or aggravated conditions, and minimal treatment of sites in the Forest's backlog. Maintenance costs for this program would remain at relatively high levels. With proper planning and timely implementation, rehabilitation measures should generally maintain aquatic habitat capability at existing levels throughout the Forest.

Alternative C

Maintenance of existing aquatic habitat conditions would be likely, provided natural disturbances are average and rehabilitation is relatively high. Such work would be similar to that described for Alternative B.

Alternative D

Measures to mitigate adverse impacts in this alternative would be much like those described for Alternative C. A major difference would be that 15 Key Site Riparian areas would be designated to provide additional protection for aquatic resources. These would be relatively large areas of more than 20 acres each, chosen for their ability to produce high outputs of riparian-dependent resources like clean water, fish, and wildlife.

The estimated investment in rehabilitation for this alternative is \$300,000 to \$500,000 per year. These measures

if implemented and maintained on a timely basis should retain existing aquatic habitat capability throughout the Forest. However, local reductions in aquatic capability could occur within the Upper Clackamas, Oak Grove, and White River drainages.

Alternatives F and H

The estimated investment in rehabilitation would be \$200,000.00 to \$300,000.00 per year. Major emphasis would be placed on the rehabilitation backlog. In the first decade, annual investments of about \$500,000.00 would be made for habitat enhancement. The anticipated result would be substantial, long term increases of 15 to 25 percent in aquatic habitat capability. In later decades, investment levels would drop significantly. Maintenance costs for structural improvements would peak at the end of the second decade following full implementation of all enhancement projects. They would remain constant at about \$70,000.00 to \$100,000.00 per year following the second decade.

Alternatives G and E

Rehabilitation investments would average about \$200,000.00 to \$300,000.00 per year. Forest backlog projects would probably be eliminated by the end of the second decade. The estimated investment for habitat enhancement would be \$200,000.00 to \$250,000.00 per year during the early decades then drop to about \$50,000.00 to \$70,000.00 per year thereafter. Maintenance costs would peak in the second decade and average about \$50,000.00 to \$70,000.00 per year. Rehabilitation investments will maintain the Forest's aquatic habitat capability in all drainages. Starting in the second decade, numerous areas would show some increase in capability. This increase would be facilitated largely through aggressive implementation of high priority habitat enhancement projects.

Alternative I

The investment in rehabilitation would be about \$100,000.00 to \$200,000.00 per year. Investments in enhancement would be largest in the first decade and average about \$1 million per year, then drop rapidly to about \$100,000.00 per year. Maintenance costs for structural improvements would peak in the second decade and then remain constant at about \$70,000.00 to \$120,000.00 per year. Aquatic capability across the Forest would increase about 15 to 25% by the end of the second decade.

(6) Effectiveness of Mitigation

The effectiveness of mitigation of impacts on aquatic resources can be divided into two areas:

(1) Measures applied during project planning and implementation to prevent impacts.

(1) Rehabilitation measures applied after an impact has occurred.

If properly planned, designed, and administered, effectiveness is generally very high for most measures in the first group. Techniques such as full suspension of logs, leave strips along streams, use of temporary roads, access control to limit recreation use, and fencing to exclude stock have proven very effective in avoiding adverse impacts.

Mitigation measures in the second group are also very effective, but are essentially restorative in character, and involve attempts to repair damage to the aquatic ecosystem. Rehabilitation does not really "fix" a damaged ecosystem, it simply hastens recovery.

Measures such as replacing lost channel structure and restoring pool habitat involve placement of structures. Since stream channels are dynamic in nature, flood events tend to remove these structures. The Forest has been successful in designing instream structures that improve habitat and that are both effective and durable. A recent study (Forsgren 1986) looked at over 600 habitat improvement structures after a 15 to 25 year flood event. Over 90% of these structures were still functioning.

The effectiveness of the mitigation measures discussed will be monitored through a network of sample stream reaches and sites, through fish counts and through monitoring of specific management activities.

(7) The Environmental Effects of Changes in Aquatic Resources on Other Components of the Environment

Fish and water have many uses. One type of use is consumptive, as mentioned in Chapter III. People use fish for pleasure or subsistence including ceremonial or commercial consumption. People on farms or in cities use water in a myriad of ways including the operation of fish hatcheries. Another use of fish and water is nonconsumptive which includes waterborne activities as well as the presence of a body of water as a part of the outdoor scenery.

Any alternative that projects a decline in the condition of the forest's aquatic resources would also forecast comparable reductions in their potential uses. Alternatives which would maintain aquatic conditions would in general maintain the level and range of their uses. Alternatives which would improve aquatic resources would generally expand future uses or increase the total range of potential uses.

Alternatives A, B, C, and D fall into the maintenance category. Alternatives E, F, G, H, and I project improved aquatic conditions and therefore increased potential uses. Alternative NC reflects general Forest-wide declines in aquatic conditions. This occurs even with aggressive implementation of mitigation measures. The

greatest levels of improvement in aquatic habitat conditions on the Forest, considered as a total environment, would occur in Alternatives F, H, and I.

f. Effects of Alternative Activities on Fire Management

Introduction

The number and size of fires depends primarily on the quantity of combustible vegetation available at the time of the fire. Amounts and types of management activities affect the number of fires that start and the level of fuel to keep them burning. Impacts of fire management will be taken up in the following part of this section.

Visitors recreational use of the Forest is a secondary source of fires. Visitors cause the largest number of wildfires, but the costs of such fires are comparatively insignificant in relation to the cost of fires started by industrial sources, primarily timber harvesting activities.

(1) General Environmental Effects of Fire

Fires not only cost large sums to control, they also can affect soil productivity, the quality and quantity of water, wildlife, fuels, and air quality. The degree of environmental impact depends on the size and intensity of a particular fire as well as how often fire occurs on any individual site. As would be expected, fires that start where fuel loadings are high and moisture low will burn with the greatest intensities and cause the greatest impacts. Wildfires frequently burn under such conditions, especially wildfires originating from industrial sources. On the other hand, fires burning where fuel moistures are high, such as prescribed fires, have low intensities, and environmental impacts are most often negligible.

Soil is an obviously indispensable resource of the forest ecosystem. The intensity of fire, and the resulting degree to which soils are exposed to heat, control the degree of changes in soil properties due to fire. Excessive heat affects land productivity and soil stability adversely. If, on the other hand, above ground fuels burn at such low intensity that soil temperature is not greatly increased, land productivity and soil stability may be unaffected or even enhanced. Fire of low intensity facilitates cycling of some soil nutrients. The loss of nitrogen is insignificant on low intensity fires, but nitrogen lost from the ecosystem due to high intensity fires burning when fuel moisture is low can be as high as 15 to 20 percent of the total nitrogen capital on the site. Fortunately, nitrogen fixation, both symbiotic and nonsymbiotic, often becomes more active following fire, and this restores essential nitrogen to the soil system. Nitrogen is required in virtually all plant growth in the forest ecosystem.

Low intensity fires may also help to control plant pathogens and as a rule do not increase soil erosion. Conversely, high intensity fires destroy organic matter and disrupt soil structure. This increases the threat of erosion and causes a loss in soil productivity potentials. Factors to be considered in evaluating the effects of fire on a specific site include (a) the frequency of burning, (b) the size and intensity of the fire, and (c) mitigating effects.

Soil characteristics are intimately connected with both the quantity and quality of water. The impact of water on soils involves such factors as rainfall interception rates, rainfall infiltration rates, the soil's ability to store moisture, snow accumulation and melt, and potentials for surface and mass erosion. The most powerful and important water quality responses associated with fire are sediment and turbidity. Fires that consume the majority of the duff layer and expose large areas of mineral soil close to streams have the greatest negative impacts. Prescribed fire conducted when the duff moisture content exceeds 75% will prevent such adverse effects.

Direct effects of fire on wildlife vary to extremes. Vertebrates rarely succumb to fire because they can flee from it. However, the immediate, post-fire environment presents surviving wildlife with a drastically changed habitat. Effects may be positive or negative depending on the species. For invertebrate animals, the main effects of fire are short term. Populations may drop because animals themselves or their eggs are killed. Their food supply and shelter may be destroyed or drastically reduced. On the other hand, populations of some species attracted by heat, smoke, or damaged trees may increase during or after a fire.

Fire affects fish and other aquatic animals in proportion to the amount of streamside vegetation lost and sediment deposited into streams. Sedimentation can reduce the size of spawning gravels or deposit fine materials that smother eggs, prevent emergence of fry, increase losses to predators, and losses of aquatic foods. A common post-fire occurrence is increased nutrient loading of streams; however, concentrations seldom reach toxic levels, and the effects on productivity are usually beneficial.

The effects of fire on air quality are presented in the section of this chapter under that title. The point to be made here is that uncontrolled emissions of large volumes of smoke primarily affect visibility.

(2) Wildfire Occurrence

Forest policy calls for the suppression of wildfires in a cost effective manner while also minimizing their effects on timber, plantations, water quality, and other resources. Wildfire incidence will be higher in alternatives

which call for increased industrial operations and road access for recreation.

Industrial operations connected with timber harvest cause the most damaging wildfires and account for most of the money spent on fire suppression. Many industrial fires start in timber stands of high value, and expensive equipment is often in the fire area.

To make matters worse, cut timber and logging slash are highly resistant to firefighting efforts so that extinguishing this class of fire is very expensive. Table IV-7 shows how industrial-caused fires would vary by alternative.

(3) Prescribed Fires

Residues from timber harvest must be treated to reduce fire hazards and to prepare the land for planting, and these requirements affect the Forest's fire environment. On-site treatment usually means piling slash with tractors and burning it, or broadcast burning.

Piling debris with tractors greatly reduces the risk of fire, and burning of piled debris is relatively safe from the risk of fire escape. However, piling slash with tractors compacts the soil, as discussed in the section Soil Resources of this chapter, and exposes the soil to erosion. The next table shows the number of acres that would require fuel treatment and acres treated by prescribed fire. Acres not treated by prescribed fire are treated using such methods as yarding unutilized materials (YUM).

Past experience shows that a small percentage of the acreage treated by prescribed fire will escape control and become a wildfire. The expected number of escape-caused wildfires appears in the next table.

(4) Wilderness Fire Management

The effects of fire in managed forests are usually negative, but some positive effects can also materialize, depending on the situation. Fires can have beneficial effects in Wilderness under carefully prescribed conditions. In all alternatives, fires will be allowed to play a more natural role in Wilderness. An analysis of ecosystem changes in Wilderness has shown little effect caused by the Forest's past policies of total fire suppression, an exception to this being the Badger/Jordan Wilderness. In all Wilderness, natural ignitions from lightning will be declared prescribed fires as long as they burn within approved prescription limits. In short, this policy will allow fire to resume its natural role in Wilderness ecosystems but within safe limits. If a Wilderness prescribed fire exceeds its prescription limits, it will be declared a wildfire and put out. Suppression of Wilderness fires will be managed with minimum environmental impact and at minimum cost consistent with Wilderness management direction.

The eastern part of Badger/Jordan Wilderness contains extensive stands of mature ponderosa pine with dense understories of shade-tolerant conifers. This environment is contrary to natural conditions that would normally not have existed had fire been allowed to play its natural role in these stands. If future site-specific analysis indicates that these stands have been significantly altered from natural successional processes, and if natural fire cannot be allowed its natural role, the use of planned, prescribed ignitions will be considered.

Table IV-7

Expected Number of Industrial-Caused Fires Greater Than One Acre

ALTERNATIVE	PER DECADE, DECADES 1 THROUGH 5		
	1	2	5
NC	8.07	7.40	6.84
A	6.51	6.51	6.51
B	8.07	7.40	6.84
C	9.16	8.25	6.33
D	7.00	6.31	6.31
E	6.31	6.16	6.20
F	4.35	4.35	5.13
G	5.76	5.76	5.76
H	1.95	1.96	2.87
I	3.67	4.64	4.45

Table IV-8

Fuel Treatments Per Decade by Alternative

ALTERNATIVE	FUEL TREATMENT PER DECADE (THOUSAND ACRES)			TREATMENT BY PRESCRIBED BURNING PER DECADE (THOUSAND ACRES)		
	DECADES			DECADES		
	1	2	5	1	2	5
NC	112	74	105	89	56	66
A	96	71	118	75	50	67
B	112	74	105	89	56	66
C	123	95	108	98	69	64
D	108	65	82	86	49	50
E	100	60	73	80	45	46
F	74	38	53	71	43	46
G	100	60	73	80	45	46
H	52	18	35	42	14	22
I	68	52	54	54	35	35

(5) Cumulative Effects of Each Alternative on Fire

There are no known cumulative effects of the Alternatives on the fire environment of the Forest.

(6) Conflicts Between the Effects of the Alternatives and Others' Plans and Policies for Fire

Alternatives that call for high levels of slash treatment would require close and careful coordination with the Oregon Department of Environmental Quality to avoid conflict with its policies. More information on this subject is provided in the section of this chapter that discusses air quality.

(7) Mitigation Measures

(a) **Prescribed fires.** Improved utilization of wood residues and yarding unutilized material (YUM) would

Table IV-8a

Expected Number of Wildfires Greater Than One Acre Caused By Prescribed Burning (Forest Service)

ALTERNATIVE	DECADE		
	1	2	5
NC	4.70	4.31	3.98
A	3.28	3.28	3.28
B	4.70	4.31	3.98
C	5.33	4.80	3.68
D	4.07	3.67	3.67
E	3.67	3.59	3.61
F	2.53	2.53	2.98
G	3.35	3.35	3.35
H	1.13	1.14	2.59
I	2.14	2.70	2.59

reduce the need to use prescribed fires. The chance of prescribed fires escaping into wildfires would be correspondingly reduced. Restricting burns to times when soil and duff moisture is high would reduce impacts on the soil. Rapid mop-up of prescribed burns would reduce air quality impacts and chances of escape.

(b) **Industrial fires.** The impacts of these fires would be mitigated through a high level of industrial fire prevention activity.

(c) **Wildfire suppression.** The effects of wildfire would be mitigated through fuel treatment, fire prevention programs, and cost effective fire suppression. Fuel treatment would decrease the fuel available for wildfires, their intensity, and the difficulty of controlling such fires. Prevention programs which concentrate on preventing expensive industrial fires would decrease fires started by human activities. Fire suppression would mitigate adverse impacts by keeping the size of the fire to a minimum while maximizing cost efficiency. Estimated costs are shown in Table IV-9.

The effectiveness of measures used to mitigate wildfire impacts is increasing on the Mt. Hood National Forest. Prescribed fire escapes have been reduced in the past ten years and increasing sophistication in the use of prescribed fires has reduced soil impacts.

Table IV-9

Expected Fire Suppression Costs by Alternative

ALTERNATIVE	FIRE FIGHTING COSTS THOUSAND DOLLARS/YR		
	DECADE		
	1	2	5
NC	\$1,831	\$1,700	\$1,590
A	\$1,363	\$1,368	\$1,363
B	\$1,831	\$1,700	\$1,590
C	\$2,044	\$1,867	\$1,491
D	\$1,622	\$1,487	\$1,487
E	\$1,487	\$1,459	\$1,466
F	\$1,104	\$1,104	\$1,257
G	\$1,381	\$1,381	\$1,381
H	\$ 636	\$ 640	\$ 817
I	\$ 973	\$ 973	\$1,126

These measures will be monitored using inventory of acres burned and review of specific projects for compliance with guidelines on acceptable levels of fuels.

(8) The Environmental Effects of Changes in Fire on Other Components of the Environment

Changes in the fire environment have profound effects on virtually every other component of the Forest's environment. Fire is a major tool in the management of conifer ecosystems throughout the west, and this Forest is no exception. In addition to its role as a management tool, fire also acts as an enormously destructive force able to damage or totally eliminate resources in almost any part of the Forest. The purpose of fire management activities in all alternatives is to allow fire to fulfill its natural role, but to suppress fires where excessive damage to the environment or investments would occur.

g. Environmental Effects of Alternative Activities on Wildlife

Introduction

Activities such as logging, road building, and burning can have immediate and direct impacts on wildlife. However, changes in habitat, mostly as a result of timber management have, by far, the longest lasting effects. Timber harvest converts stands of mature and old-growth trees to clearcut openings, shelterwoods, plantations, and other managed-stand conditions. This environmental conversion typically changes a stand containing trees of different ages, which is structurally complex and multi-layered, into an even-aged stand with fewer species of trees, fewer snags, and fewer fallen trees.

These changes affect different species of wildlife in a variety of ways. Populations of species that require the environment provided by mature or old-growth will

decline as a result of timber harvest. On the other hand, many herbivorous species will increase in the early stages after timber harvest in response to increased amounts of shrubs, grasses, and forbs. Under timber management, forest land will primarily provide forested habitat in the age classes between 20 and 120 years along with the grass/forb stage following clearcuts. The section Vegetation of this chapter provides additional information about this subject.

The primary measurement of each alternative's impact on wildlife is the viability of populations of indicator species. These species have been chosen to represent the needs of all wildlife that require a particular habitat, or that respond similarly to different management practices. Management indicator species include: spotted owl, which requires relatively large tracts of old-growth; pine marten and pileated woodpecker, which depend on stands of mature or old-growth forests with abundant snags and fallen trees; deer and elk, which are sensitive to the amounts and distribution of cover and forage, density and uses of roads; and turkey and silver gray squirrel, which require a mixture of mature ponderosa pine and Oregon white oak.

The potential effects of management activities on threatened, endangered or sensitive species are also important considerations. However, these effects are generally very localized so that significant adverse effects can be avoided through the use of the biological evaluation procedure described in Chapter III under the heading of Threatened, Endangered and Sensitive Plants.

Special habitats, particularly riparian and wetland areas, are needed to support a diversified wildlife community. Equally important, mature and old-growth coniferous forests provide the primary breeding habitats of more species than any other stand condition. Therefore these types of forest contribute to the diversity of wildlife out of proportion to their size. A third type of wildlife habitat, the grass/forb and shrub stages lasting up to about 20 years following timber harvest, contributes significantly to the diversity of animal life. No animal species appears to find a primary habitat in only the sapling-pole stage. This stage occurs between 20 and 120 years after harvest.

To compare the different effects of alternative activities on wildlife, variables to be considered are the quality, amount, and distribution of the required habitats. Data for the requirements of wildlife species and site-specific stand conditions are not sufficient to segregate habitats by quality on any realistic basis. Therefore one must assume that all habitats of a certain type, such as mature coniferous forest, would be of equal quality for a given indicator species. This leaves the amount and distribution of habitats as the primary measurements of habitat viability.

(1) Environmental Consequences of Alternatives on Wildlife

Alternative NC

This alternative would have the most substantial negative effect on wildlife of all alternatives considered. Although drainage-specific data on age class distribution over time is not available, it is expected that detrimental effects will occur in virtually all drainages. Specific impacts include an inadequate distribution of optimal thermal cover in deer/elk winter range. The anticipated result is an overall decline in elk and deer populations. Since Minimum Management Requirements (MMRs) are not included in the design of this alternative, it would provide the lowest level of mature and old-growth habitat. The existing habitat would also be the most poorly distributed. Large expanses of near even-aged stands would be the rule. The potential for the loss of species viability, especially spotted owl, would be the greatest of all alternatives. This alternative does not provide special provisions for pine/oak habitat, and as a result turkey and silver gray squirrel populations would take the most substantial decline.

MMRs were designed to provide mature/old-growth habitat throughout the planning area (the Forest). The quantity and distribution of this habitat would not occur at this minimum level as it did in all other alternatives. It was assumed that habitat sufficient to meet the needs of potential resting sites for the bald eagle would be provided by MMR areas. These potential rest sites, referred to in the Pacific Bald Eagle Recovery Plan, would not be provided.

Alternative A

This alternative would produce several noticeable effects on wildlife. During the first decade, the grass/forb stage would comprise 14% of the Forest. Three drainages would fall below the minimum objective of 10% (the optimum forage ratio is 60%). By the fifth decade, most drainages would fall to 9% or less, and so would the Forest-wide total. If this reduction in forage were to combine with an inadequate distribution of optimum cover (40%) on winter range, the anticipated result would be an overall decline in deer and elk populations. From the first to the fifth decade, according to present estimates, deer populations would drop from 18,200 to 11,700, and elk would drop from 2,700 to 1,700.

Throughout the Forest, mature and old-growth coniferous habitat would remain relatively high through the fifth decade. This alternative complies with MMRs, and therefore this habitat would be adequately distributed to meet those requirements. However, six drainages would have less than the minimum objective of 15% old-growth for cover. The alternative does not make special

provisions for pine/oak habitat, and as a result turkey and silver gray squirrel populations could be expected to decline.

Alternative B

During the first decade, the grass/forb stage (forage) would cover 16% of the the Forest. Four drainages would fall below the minimum objective level of 10%. By the fifth decade, most drainages would provide less than 10% of these forage-producing stages, and the level for the entire Forest would drop to 9%. The result would be reductions in deer and elk populations to the same level as anticipated for Alternative A.

Overall, the number of stands of mature and old-growth trees would remain at relatively high levels into the fifth decade, and compliance with MMRs would assure at least an adequate distribution of this habitat. Three drainages would have less than 15% old-growth, and virtually all drainages would contain more than 15% optimal thermal cover on deer/elk winter range. This alternative does not make special provisions for pine/oak habitat.

Alternative C

By the fifth decade, the grass/forb stage would fall below the 10% objective level in most of the fifteen drainages as well as throughout the Forest. Deer and elk populations would fall even lower than under Alternative A. This alternative calls for the highest level of development of the Forest's transportation system in support of timber production, and this would have additional adverse effects on deer and elk.

This alternative also would provide the lowest levels of mature and old-growth stands of any alternative. As a result, it would have the lowest predicted population levels for management-indicator species of any alternative. It does not provide for management of pine/oak habitat.

Alternative D

In decades one and two, the grass/forb stage would be less than the minimum objective of 10% in five drainages. By the fifth decade deficiencies would apply to 11 of the 15 drainages. This alternative has high development and use of the Forest's transportation system, and big game habitats would be adversely affected in proportion.

Although a minimal amount and distribution of mature and old-growth habitat would be maintained by compliance with MMRs, these stands would still fall to the second-lowest level of any alternative. Timber harvest would not be scheduled for 10% of the pine/oak habitat.

Alternative E

As with departure Alternatives B, C, and D, this alternative accelerated harvests in the early decades would lead to relatively increased areas in the grass/forb stages. In the first two decades, levels stay well above 10% for the Forest as a whole, but five drainages fall below the minimum level. By the fifth decade, only two drainages of the fifteen exceed the minimum 10%. Deer and elk populations could be expected to decline from the first through the fifth decades.

This alternative is similar to Alternative G in most respects, but its higher rates of harvest of old-growth in the early decades means that this habitat would become fragmented sooner than it would in Alternative G. Nonetheless, compliance with MMRs would assure an adequate amount and distribution of mature and old-growth forest. In each of the first and fifth decades, old-growth would fall below 15% in two drainages.

Alternative F

This alternative would rank third as having the greatest adverse effect on the grass/forb habitat. In the first decade, this stand condition would fall below the minimum objective of 10% in six drainages; in the second decade the number would rise to eight drainages; and by the fifth decade shortages would occur in 14 of the total 15. However, investment in mitigation and enhancement, as discussed later in this section, should produce higher populations of deer and elk than would be produced by any alternative discussed so far.

In each of the first and fifth decades, old-growth forest would fall below 15% in only one drainage. Estimated populations of spotted owl, pine marten, and pileated woodpecker would be second-highest of any alternative considered. Populations of silver gray squirrel and turkey would also increase to the second-highest levels, as 50% of the pine/oak habitat would be unavailable for timber harvest.



Pine oak stands provide excellent wildlife habitat

Alternative G

With respect to wildlife, this alternative is similar to Alternative E except that slightly less of the grass/forb stage would be present in early decades, and more of it available by the fifth decade. In the first decade, five drainages would fall below the minimum grass/forb objective of 10%, and this would increase to seven drainages by the second decade. In the fifth decade, 12 drainages would have less than 10% of the early successional stages. Deer and elk populations would be similar to those of Alternative E, though their numbers would be somewhat lower in the early decades and higher in later ones.

Harvest of old-growth forests at a lower rate than in Alternative E would lead to only one drainage falling below 15% old growth in the first decade, and three drainages in the fifth decade.

Alternative H

This alternative would produce the least acreage in the grass/forb stage. In the first decade, eight drainages would have less than 10% forage. Twelve and fifteen drainages would be equally deficient in the second and fifth decades respectively. Investment in mitigation and enhancement projects, as discussed later in this section, would offset these trends by providing high quality forage, and by the fifth decade this alternative would have the highest populations of deer and elk. Low levels of development and use of the Forest's transportation system would additionally improve habitat quality for big game.

This alternative provides more old-growth forest habitat than found in any other alternative. Only one drainage would provide less than 15% old growth, and that only in the first decade. Estimated populations of spotted owls, and other species for which they act as an indicator, would become correspondingly high. Retention of old growth in the pine/oak zone would also allow for high population levels of turkey and silver gray squirrel.

Alternative I

The second lowest levels of grass/forb stage would be produced under this alternative. Seven, ten, and fourteen drainages would provide less than 10% forage in the first, second, and fifth decades respectively. Deer and elk populations would be the second highest of any alternative.

Only one other alternative would provide a higher level of mature and old-growth habitat than produced under Alternative I. Distribution of this habitat would be similar to Alternative H. One drainage would fall below 15%, and this would occur only in the first decade. Populations of wildlife depending on this habitat would benefit accordingly.

(2) Cumulative Effects of Alternative Activities on Wildlife

The most likely cumulative effects of management activities on wildlife would result from reductions in old-growth and mature forest habitats. These habitats have been significantly reduced on private timber lands in northwestern Oregon, and continued management of private lands for wood production will mean that younger stand conditions would continue to dominate. The only significant remnants of old-growth habitats are on public lands. Maintenance of these habitats contributes both to the maintenance of viable populations of dependent wildlife, and to overall animal diversity. Alternatives that harvest less old-growth, or do it at a lower rate and maintain distribution of these stands, are less likely to have significant cumulative effects that contribute to losing dependent wildlife.

(3) Conflicts Between the Effects of the Alternatives and Others' Plans and Policies for Wildlife

Alternative NC has the highest potential for conflict with plans and policies of other agencies in its failure to maintain adequate habitat (distribution) for the northern spotted owl. This alternative is not consistent with inter-agency agreements with the Oregon Department of Wildlife and the Bureau of Land Management which commit the Forest Service to maintain a portion of the populations needed to maintain the viability of this subspecies.

Domesticated livestock compete with elk and deer for forage. However, the number of domestic livestock grazed on the Forest is so small, this competition is not significant. Livestock damage to elk and deer range could be worse around watering areas. Such damage would be prevented by fencing the pond or spring and piping water to a stock watering tank. Wildlife would not be fenced from water by this method as deer can jump over the fence, and birds and small mammals would either go over, through, or under the fence.

(4) Mitigation Measures for Wildlife

Most mitigation measures are common to all alternatives and vary only in the emphasis they place on different resources. For deer and elk, reductions in forage can be partly mitigated through seeding, planting, and fertilizing to improve the amount and nutritional quality of available food. Loss of hiding or security cover, and the adverse effects of roads, can be alleviated to some extent by temporary or seasonal road closures. Loss of old-growth and mature forest habitats cannot be mitigated very effectively, although retaining and creating snags and fallen trees can help to provide critical habitat components which prevent the total elimination of some wildlife species relying on older forest stands.

Leaving buffers around meadows and in riparian areas along streams helps to maintain the quality of these important habitats. The section Aquatic Resources of this chapter provides additional information on this subject.

Mitigation by retaining snags and down logs remains essentially constant across alternatives as discussed in standards and guidelines. However, as timber harvest levels increase, costs of meeting wildlife tree standards would increase in proportion because more protection would be needed on more acres.

Mitigation through investments to improve forage quality and quantity are greatest in Alternatives E, G, F, H, and I, respectively. Little or no mitigation through investments are provided by Alternative NC.

Wildlife mitigation will be monitored using population counts for deer and elk, silver gray squirrels and turkeys. Mitigation of impacts on spotted owls will be monitored through verification of occupancy and nesting as well as vegetation sampling to determine suitability of spotted owl habitat areas. Mitigation of impacts on pine marten and pileated woodpecker will be monitored through habitat suitability and distribution.

(5) The Environmental Effects of Wildlife Changes on Other Components of the Environment

The most noticeable interactions between wildlife and other components of the Forest's environment can be seen in various forms of recreation. These include consumptive activities such as hunting and trapping, and nonconsumptive ones, such as wildlife observation. Hunting opportunities are directly related to the available populations of deer, elk, turkey, and silver gray squirrel. A forest environment that supports a diversified stock of wildlife provides a higher quality recreational experience for visitors who enjoy observing wildlife, whether game or nongame, than will be found on a forest with limited animal life.

Wildlife populations can also influence timber resources. Higher levels of deer and elk, as well as species like pocket gophers and mountain beavers that may increase in clearcut areas, could present problems for reforestation. Seeding of grasses and forbs may provide sufficient alternative forage and reduce adverse effects on tree seedlings. A potential for competition for forage also exists between domestic livestock and deer and elk. However, no significant conflicts are foreseen at projected levels of livestock grazing or big game populations.

2. Effects of Alternatives' Activities on the Human Environment

a. Effects on Communities

Introduction

The impacts of management activities on communities in Clackamas, Hood River, Multnomah, and Wasco counties will be felt primarily through changes in supplies of Forest products and services. These include wood products, money paid to county governments, and visits to the Forest for recreation. Secondary impacts will be felt through range use, fish harvests, and Forest Service expenditures.

Each type of community impact can be tracked through the alternatives by estimating the quantities of employment and income each would generate. To prepare such estimates, a model was designed which predicted employment and income for the first decade using the outputs projected for each alternative. These estimates

were then compared to current levels of economic activity. The comparisons show how each alternative's economic impact would be felt by the Four County Area.

Economic comparisons were made using the model to estimate all Forest income, including employee compensation and property income. Employment measured includes direct, indirect, and induced jobs. Direct employment means jobs created by the sale of finished products. Indirect employment means jobs that result from the purchase of goods and services used in producing the Forest's products. Induced employment means jobs that result from purchases made by employees and their families as a result of jobs generated by Forest outputs. The next three graphs show estimated changes in employment and income, and total payments made to counties during the first decade. Current levels of employment and income are based primarily on Forest average outputs up to and including 1986 and do not equate to the NC (No Change) Alternative which deals with the future. Outputs such as timber which show year

Figure IV-11

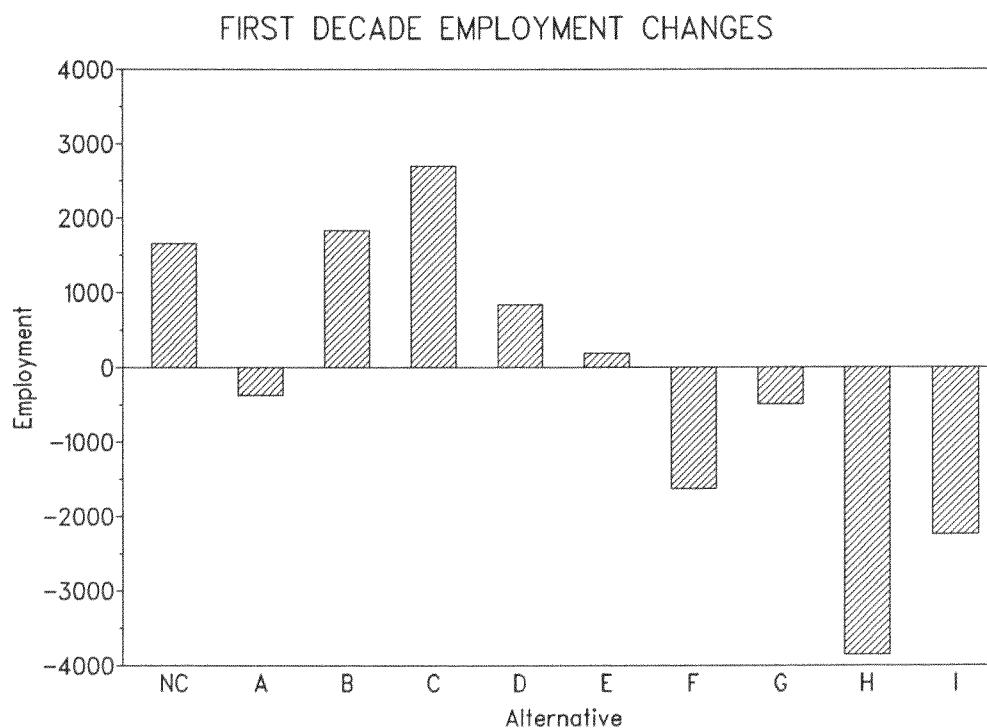


Figure IV-12

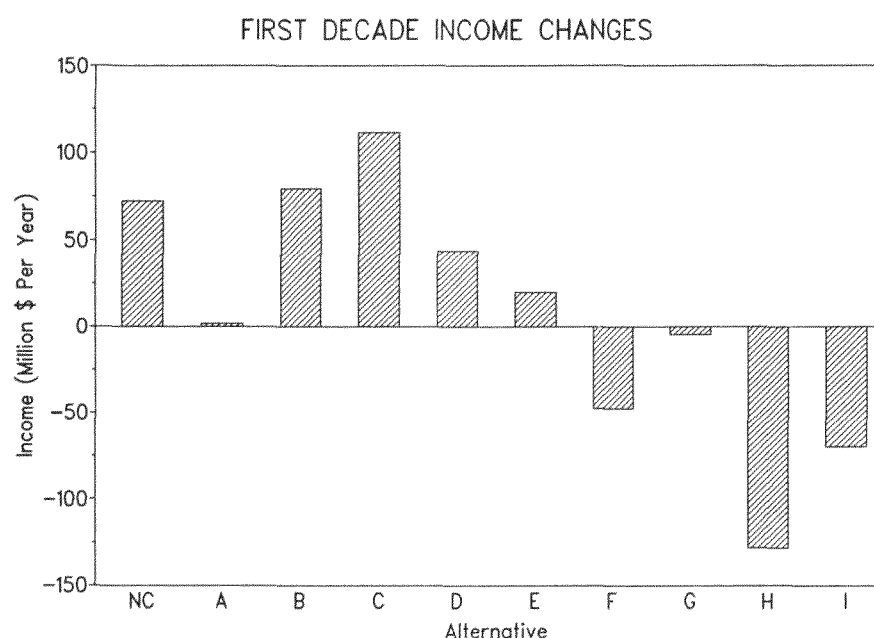
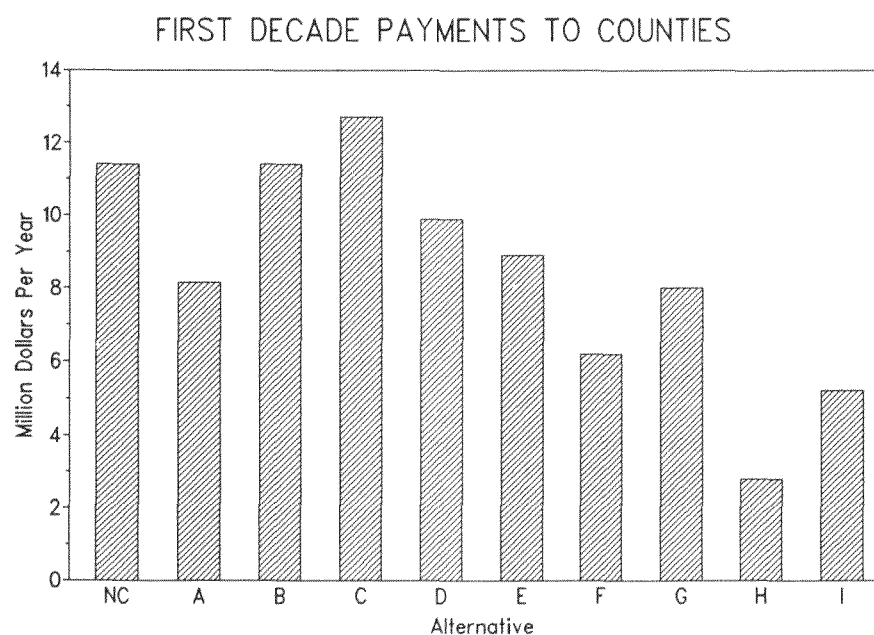


Figure IV-13



to year fluctuations are averaged over a 10 year period (1977-1986).

One way to gain perspective on estimated changes in employment is to examine the numbers in relation to the area's economy as a whole. The work force in the Forest's area of influence totalled approximately 250,000 people in 1984. It is estimated that Forest-related employment is roughly 7% of the total work force.

Therefore gains or losses in Forest-related jobs would produce a comparatively minor impact on the economy of the total area.

However, impacts will vary by community because changes in employment would not be distributed evenly throughout the area of influence. For example, an increase of 5% in employment in wood products, using timber cut on the Forest, would have little impact on the area as a whole. But that same 5% could boost the for-

tunes of towns like Molalla or Tygh Valley substantially. A number of small towns rely on Forest timber products for employment. Others, such as the Mt. Hood corridor communities, are far more concerned about the maintenance of visual quality and recreation opportunities because these are seen as necessary to the good health of local businesses. People in these communities may consider timber harvest as an economic liability, especially if the harvest area would be visible from Highway 26.

Considering the Forest's area of influence as a whole, grazing on the Forest is of little consequence. However, some families on the east side may find that grazing cattle on the Forest's ranges would make the difference between staying solvent and going broke. The main interests of Native Americans on the Warm Springs reservation are directed toward the alternatives' plans for anadromous fish habitat and cultural resources; although they are also concerned about the Forest's timber and visual resources. The point here is that impacts of an alternative show great variation between communities, depending on their economic base, and their culture.

Regardless of the alternative selected, Forest products employment will continue to fluctuate as the economy changes, just as it has in the past. Between 1978 and 1984, direct employment in the wood products industry in the Forest's area of influence changed by more than 25% while the volume offered for sale by the Forest remained constant. As discussed in Chapter III, the wood products industry is cyclical, with wide variations in demand.

Each of the alternatives would impact the communities in more ways than employment and income. Less tangible but other important factors must be considered. People in the area of influence look to the Forest for water, visual quality, recreational opportunities, fish, game, firewood, and other outputs. If a particular alternative changes these outputs of the Forest, that change would impact the quality of life for many nearby residents. Although most of these outputs are not marketed and do not have a cash value, their importance can be inferred in several ways. The most obvious measure is the strong opposition generated by proposals for activities which reduce these nonmarket outputs. For example, timber sales in the Mt. Hood-Highway 26 corridor have been opposed by local residents when such sales are perceived to impact visual quality, water quality and other nonpriced benefits.

Another way to gauge the importance of these outputs is to look at why people live near the Forest. Many people live near the Forest specifically for the amenity values available in rural areas. Living in these areas usually represents an opportunity cost, either in high commuting costs or in lower wages. These opportunity costs have been "paid" by many rural residents and any alternative

that reduces the value of what a rural resident has "bought" will result in a lower quality of life for that resident (Power 1983).

The remainder of this section will be devoted to a discussion of each alternative's impact on the communities in the four-county area of influence.

(1) Direct Effects of Alternative Activities on Communities)

Alternative NC

This alternative would produce high levels of commodity resources, benefitting communities with high levels of wood products employment. In the first decade, both employment and income would increase. Employment would increase by an estimated 1700 jobs or 9.5%, due primarily to increased wood products employment. Payments to counties would increase slightly from the current level of \$9 million to a total of \$11.4 million.

Businesses that rely on money spent by visitors to the Forest would continue to support 11,600 recreation related jobs. Fishing and hunting on the Forest would remain at current levels, then decline in later decades.

Alternative A

This alternative would cause a decrease in timber related employment. Employment would decline by 2.8%. Payments to counties would decrease slightly from current levels to a total of \$8.1 million. No measurable changes are estimated for employment in recreation, ranching, commercial fishing, or the Forest Service.

Fishing and hunting on the Forest would remain at current levels initially, then decline in later decades. Fuelwood harvest would decrease from the current level of 28,000 cords per year to 23,000 cords per year.

Alternative B

This alternative is notable for its increase in the amounts of raw materials available to support wood products employment. Forest-related employment and income would rise significantly. This additional economic activity is fueled by an annual harvest level of 444 MMBF producing an increase of 10.4% in total employment and a 20% increase in wage and property income. Payments from the Forest to counties would rise to \$11.4 million per year and support increased employment in county road maintenance and schools. The projected total increase in direct, indirect, and induced employment generated by payments to counties would be 25%.

Forest Service employment would rise 30% in response to increased activity in preparations of timber sales, road construction, slash disposal, fish and wildlife habitat rehabilitation, and other timber-related programs. Increased transitory range would provide an increase of 40%; however, the Mt Hood's range allotments con-

tribute a total of only five jobs currently. Employment in fishing activities would not change. Employment and income related to recreation would be similar to levels estimated for Alternative A.

People seeking unroaded recreation experiences would have fewer opportunities under this alternative. However, the Forest would have many more acres available for roaded recreation with accompanying jobs and income. The opposite side of such increases is that scenic quality along the Mt. Hood Loop would be reduced and this could cause lost income to businesses in communities like Zig Zag, Rhododendron, Government Camp, and Mt. Hood. Since Alternatives B and C do not call for additions to the Wild & Scenic Rivers system, reduced opportunities for recreation on Forest rivers could have some local impact.

Alternative C

This alternative has the highest rate of timber harvest, and therefore, it also has the highest rate of employment and income. Forest-generated employment would increase by 15% and income would increase by 30%. These increases would be fueled by a 51% increase in wood products employment. Payments to counties would reach an annual rate of \$12.7 million and support a 42% increase in employment related to those payments. Forest Service employment would rise 48% to take care of the workload imposed by the harvest rate. Range employment would rise due to the emphasis on first decade harvest and subsequent increases in transitory range. Many of the added jobs would benefit small communities near the Forest boundaries. Portland's economy would derive some secondary benefits.

This alternative is the only one calling for increased harvest in the Bull Run watershed. Since this watershed is the source of controversy under current management direction, the alternative would aggravate existing controversy.

In recent years, the trend for some communities has been away from reliance on wood products employment and income, with increased reliance on tourism, trade, and other service types of jobs. The harvest levels in this alternative could reverse this trend. Wood products employment would increase and reliance on service employment could decline.

Fisheries income and employment would not change. Fuelwood availability would increase by 10,000 cords per year.

People seeking a semiprimitive recreation experience would have fewer opportunities under this alternative, with opportunities falling far below demand over time. Popular Wilderness destinations would be used heavily,

with attendant degradation of campsites and trails. The Forest would offer numerous opportunities for roaded recreation with its associated jobs and income. The Forest's appeal to many visitors would decline due to reduced visual quality. Businesses on major travel routes could be adversely affected. Reduced opportunities for recreation on the Forest's rivers would have some local impact because this alternative does not include additions to the Wild and Scenic River system. In the long run (two to five decades) the quality of visual, recreational and other noncommodity outputs would decline.

Alternative D

Implementation of this alternative would produce a 5% increase in total employment and an 11% increase in income over current levels. Payments to counties of \$9.9 million would support about 10% more jobs than currently available because of Forest increase in receipts. Range employment and income would rise in response to increased transitory grazing on the east side. Firewood availability would be near current levels. The more popular, developed recreation sites would be used heavily, corresponding to the reduction in unroaded recreation opportunities described in previous alternatives.

Alternative E

Alternative E is essentially a continuation of current management direction with the addition of minimum management requirements to protect critical resources. The protection of Forest resources would reduce the land base available for timber harvest. A corresponding drop in harvest levels is mitigated to some extent by harvesting above the Forest's long-term sustained yield capacity in the first decade. This alternative would increase employment by about 1%. A timber harvest of 347 MMBF per year increases employment and income in wood products industries by 6%. Employment related to recreation would rise slightly along with employment in fisheries and range. Payments to counties would remain at an average 8.9 million dollars per year. Fuelwood availability would drop slightly.

Alternative F

This alternative would reduce influence area employment 9% and income 12%. These declines are the consequence of a 27% loss of jobs derived from wood products originating on the Forest and a concurrent drop in county payments to 6.2 million dollars a year. Employment generated by payments to counties would decline more than 30% and Forest Service jobs 10%. Fisheries-related jobs would increase 11%.

This alternative would have a heavy impact on nearby communities with a high percentage of forest products

workers. This alternative's emphasis on roaded recreation and visual management would tend to benefit residents of metropolitan Portland and visitors from more distant areas. These groups tend to use the Forest's amenities and do not rely on commodities for employment. This and two other high-amenity alternatives, H and I, would increase the attractiveness of the Forest for people beyond the area of influence. Fuelwood available would drop to 17,000 cords per year.

Alternative G

This alternative would reduce total employment 3% and income 1%. These reductions would come about as consequence of a 6% decrease in timber related employment. Payments to counties would average \$7.9 million per year.

Allocations of land to recreation and visual management under this alternative would tend to benefit businesses which cater to the recreation trade and visitors for pleasure. In the long run the alternative's emphasis on recreation and visual quality could increase the incomes of businesses in specific areas, such as the Mt. Hood Corridor and the Columbia Gorge. Fuelwood derived from slash would decrease to 17,000 cords per year.

Alternative H

Implementing this alternative would reduce total employment 22% and income 32%. This is due to a sharp reduction in timber harvest which would curtail wood-related employment and income 67%. Total harvest volume would be reduced to 108 MMBF per year. These changes would substantially affect communities with a high percentage of forest product workers. Anticipated harvest levels of 12 MMBF per year in the associated species group would cause supply problems for mills in Tygh Valley, Maupin, and other east side communities. Payments to counties would drop to \$2.8 million a year.

Recreation employment and opportunities for unroaded recreation would increase, but road construction would be reduced, decreasing roaded recreation opportunities. Fisheries employment would rise 10% in response to extensive measures for the protection of riparian ecosystems.

Fuelwood harvest would drop to about 6,000 cords per year. This level of supply would not meet wood-burning needs in local areas and some users would have to switch to alternative fuel supplies.

Alternative I

This alternative's impacts on communities relying on wood products for employment and income would be similar to Alternative H but to a lesser degree. Alternative I would reduce employment 13% and income 18%, mainly because employment and income in wood-

products industries would drop 38%. Payments to counties would drop to \$5.2 million, with a resulting 42% decline in employment generated by these payments. Forest Service employment would drop 14%, offset to some degree by slight increases resulting from employment in recreation and fisheries. Fuelwood supplies would decline 40%.

(2) Cumulative Effects of the Alternatives on Communities

Some small communities in the influence area have been hurt by reduced private timber harvest, reduced agricultural employment, declining demand for northwestern wood products, and the mechanization of sawmills. These factors have recently caused high unemployment and varying degrees of social dislocation in the area. The cumulative impacts of alternatives with relatively low volumes of timber harvest would probably aggravate this situation. These alternatives would include F, G, H, and I.

Community economic benefits gained by increased logging in Alternatives NC, B, C, D, and E would be offset to some degree by decreasing mill employment per unit of output.

A contributing factor to the overall consequences would be the alternative selected for the Willamette National Forest. If The Mt. Hood National Forest selects a low harvest alternative, and Willamette does the same, the combined impact would affect communities which use logs from both Forests by depressing the Forest products sector of local area economies. Mill towns south of the Forest, such as Mill City and Lyons, would be most affected.

Reduced supplies from McQuinn strip lands managed by the Warm Springs Indian Tribes (refer to Chapter III, Indian Concerns, for description) would combine with other factors to reduce raw materials available to Wasco County sawmills. As of January 1, 1992, timber harvested from the McQuinn strip will no longer be required to be sold at public auction to non-tribal buyers. It is most likely that the Warm Springs Tribe will use McQuinn strip timber in their mill at Warm Springs, and therefore roughly 20 MMBF per year would no longer be available to Wasco County mills. If this factor is combined with declining timber inventories on private lands and reduced timber on the Mt. Hood National Forest, supplies of logs for area mills would become a question.

In the past, Forest harvests have fluctuated widely, but production for Hood River and Wasco Counties have generally averaged 58 MMBF per year. Alternatives F, G, H, and I would supply less timber than this average production.

Several of the effects under discussion could combine to produce cumulative effects on the social and economic

environment of the communities in the area of influence. Loggers, mill workers, and local businesses in communities near the Forest where wood products are the main generator of economic activity would be affected by declining employment and income.

In alternatives with very low harvest levels, such as H and I, economic conditions may decline drastically in mill towns near the Forest. It is possible for some people to retrain or to relocate to areas where more jobs are available. However, less mobile, older workers may face extremely difficult adjustments for themselves and their families. Some people may have to take lower paying jobs or seek public assistance. The impacts go beyond lost income. Alcohol consumption for example, may increase along with various family and mental health problems.

The consequences of such social and economic problems depend in part on the individuals and communities affected. In addition, social dislocation is to some extent related to the suddenness of job termination. In weighing the cumulative effects of alternative activities, including how they may affect the social fabric of a particular community, one must bear in mind that planned reductions in timber harvest levels could have very different effects on nearby communities than jobs lost in an unexpected recession. The closure of a mill during an economic downturn is often completely unannounced and displaced workers face a depressed job market. Phased reduction of raw materials supplies may offer opportunities for displaced workers that would not occur in a recession generated layoff.

(3) Conflicts Between the Effects of the Alternatives and Others' Plans and Policies for Communities

Recommendations of the Oregon State Board For Forestry were an integral part of the process of formulating the nine alternatives, especially that recommendation which reads: "Encourage all forest landowners to consider the effects of their harvest schedules on local communities and on the economy of the state."

However, none of the alternatives under consideration meet Oregon Department of Forestry goals for timber supply from the Mt. Hood National Forest. (Forestry Program For Oregon, Salem, 1985 pp 3.) Alternative C comes closest by meeting 97% of the first decade targets of the program. The comparisons of alternative programs in Chapter II contain an extensive discussion of Forestry Program for Oregon.

(a) Mitigation Measures for Communities

One possibility for reducing the impacts of declining harvest levels, as provided in Alternatives E, F, G, H, and I, would be to reduce gradually the log flows to communities relying on timber. A gradual reduction in har-

vest levels would lessen the shock of a change in the communities' economic structure and give their people time to plan for coming employment and income conditions. The effectiveness of gradual reduction can be inferred by looking at the components of more abrupt economic shocks to mill communities. One study indicates that the suddenness of plant closures is a major factor in the intensity of economic dislocations (Weeks, 1982). If this is the case, then phased reduction of harvest levels will partially mitigate impacts on communities. The major drawback to this type of mitigation is that a gradual reduction in harvest in the beginning of the first decade of the plan (by initially maintaining it above the planned decadal average) would necessitate that harvest be reduced below planned levels in the latter part of the first decade to compensate.

A more site specific mitigation of harvest level reductions is to provide timber for specific communities which are especially hard hit. This pre-allocation of timber to specific communities has been tried in various forms with varying success.

A number of mitigation measures are available to communities faced with declining supplies of raw materials. Although these measures are beyond the control of the Forest, they are listed briefly here.

Other forest owners presently supply about 35% of the wood for mills in the area of influence. These owners may increase supplies to area mills contingent on a variety of factors. Major variables affecting these sources would be price and the availability of timber at the time of demand.

Mills unable to make a satisfactory profit for a corporate owner may be able to operate under an employee buyout and thereby provide jobs and income to the community.

Unemployment compensation, dislocated worker programs, and retraining programs may mitigate the problems faced by people out of work due to changes in harvest levels.

Some communities may change emphasis by promoting service employment.

Alternatives NC, A, B, C and D will have adverse impacts on amenity resources. These impacts will in turn affect the economic and social life of communities surrounding the Forest. Measures to mitigate impacts on recreation, visual quality and other amenity resources can be found in other parts of this chapter. Mitigating the effects of reduced amenity resources will be contingent on the ability of residents to change their lifestyles and the ability of businesses to adjust their marketing.

(4) The Effects of Community Changes on Other Components of the Environment

(a) Demand for the Forest's Products

Alternatives F, G, H, and I could in the short run reduce the economic stability of some smaller communities in the Forest's area of influence by reducing the supply of timber products. In the long run, reduced wood supplies

may force communities to diversify their economic base, particularly where other employment opportunities are available. If a shift of this type were to take place, demands on amenity resources would increase.

(b) Minorities and Women

The impact of Forest Service programs on these groups is tied to the agencies' hiring and contracting procedures. None of the alternatives would directly increase opportunities for minorities and women. Employment opportunities would increase or decrease along with changes in the Forest's activities and total employment



Developed Recreation Site

budget. Alternatives with substantial increases in timber harvest and stand treatment would most likely increase the total employment budget.

b. Effects of Alternative Activities on Recreation Opportunities

Introduction

Use of the Forest for recreation can be generally classified as either developed recreation or dispersed recreation. In order to describe potential recreation opportunities as accurately as possible, dispersed recreation has been further divided into roaded or unroaded (non-Wilderness) dispersed recreation.

Outdoor recreation activities on the Forest take place in many different settings. The way the Forest is managed can affect, either directly or indirectly, those recreation settings as well as visitors' recreation experiences. The

relative mixture of recreation settings and experiences that would be available to Forest visitors would be determined by land allocations to be established by each alternative. Land allocations would also determine to some extent the Forest's capacity for meeting present and future demand for various recreation opportunities.

The construction and maintenance funding levels of recreation facilities and services under each alternative can also affect recreation opportunities, especially in developed recreation areas. Management of recreation facilities and services includes operating and maintaining campgrounds, trailheads, trails and associated facilities, boat ramps, ski areas, visitor information centers, and parking lots; providing or improving structures or equipment; and providing access to recreation areas.

(1) Direct Effects of Alternative Activities on Recreation

(a) Developed Recreation opportunities

The number of developed sites is about the same in all alternatives. The service level provided, i.e. operation and maintenance of the sites and the administration, and the resulting quality of the recreational experience are at the standard level in all alternatives.

All alternatives emphasize rehabilitation of existing facilities which have deteriorated. Existing developed sites in all alternatives are operated and maintained at Full Service Level. Funding, based on recreation site studies will be used to upgrade or expand existing sites operating near capacity. None of the alternatives call for significant net changes in developed recreation use.

Based on current estimates, the Forest will be able to meet overall demand for developed recreation through the year 2030 only by granting concessions and awarding special permits for private operation of Forest Service owned sites and facilities and by upgrading existing facilities to standard (full service) levels.

(b) Dispersed Recreation opportunities

The alternatives vary as to how well they meet demand for dispersed recreation in particular ROS settings as shown in table IV-10.

Projected demands for dispersed recreation opportunities in unroaded areas described as Primitive, or Semi-Primitive Nonmotorized would exceed the supply in any of the alternatives. However, the alternatives vary considerably in the dispersed unroaded recreation opportunities that would be offered. Primitive recreation opportunities would be limited to existing Wilderness areas in Alternatives A, NC, B and C. The rest of the alternatives would provide some primitive opportunities; due to keeping at least portions of the existing unroaded areas, if not all of them, in an unroaded condition.

Table IV-10

Percent of Demand Supplied in Year 2030 by Type of Opportunity

ALTERNATIVES	SEMI-PRIMITIVE NONMOTORIZED	SEMI-PRIMITIVE MOTORIZED	ROADED NATURAL	ROADED MODIFIED
NC	14%	2%	69%	496%
A(No Action)	14%	2%	132%	350%
B & C	1%	0%	65%	529%
D	13%	2%	109%	406%
E & G	17%	3%	130%	346%
F	24%	4%	208%	151%
H	48%	4%	181%	172%
I	36%	6%	205%	129%

The availability of Semi-Primitive, Nonmotorized recreation opportunities would depend on whether a number of currently unroaded areas, such as Special Interest Areas, Research Natural Areas, and other undeveloped areas, would be managed for other resource development. Alternatives F, H, and I, which strongly emphasize unroaded recreation opportunities, would provide the greatest opportunities for Semi-Primitive, Nonmotorized types of recreation activities. Alternatives A, NC, B and C emphasize commodity development and would therefore offer the least opportunity for unroaded recreation. Alternatives D, G, and E would occupy the middle of this spectrum.

Under all of the alternatives the existing trail system is improved and expanded. Trail construction and reconstruction projects levels off in the third decade.

Road construction and timber harvest activities will continue to obliterate portions of some trails, especially in the alternatives where these activities are the greatest. The negative impacts should be lessened through mitigation by the disturbing activity.

Table IV-11 and Figure IV-14 show the distribution of the Forest's area across the Recreation Opportunity Spectrum (ROS) described in Chapter III.

(2) Cumulative effects on Dispersed Recreation Opportunities

Cumulative effects of alternative activities on dispersed recreation would relate mainly to the development of areas which currently offer Primitive, and Semi-Primitive, Nonmotorized recreation opportunities. Alternatives which would allocate existing unroaded areas for timber harvesting and other resource development activities gradually reduce opportunities for dispersed recreation in an unroaded setting. The rate that unroaded areas would be developed indicates how soon the recreation opportunities in a particular area would be modified from a Primitive or Semi-Primitive, Nonmotorized setting to a Roaded Natural or Roaded Modified setting. Appendix B, DEIS, Rooding of Unroaded Areas, compares the maximum percent of each unroaded area which can be harvested in the first decade under the provisions of each alternative. As

Table IV-11

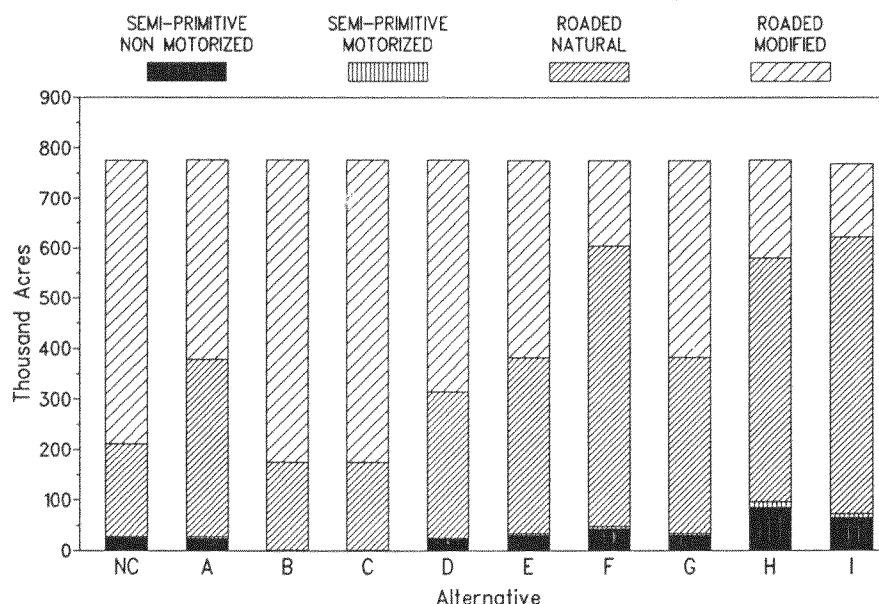
Dispersed Recreation Opportunity Spectrum Acres by Year 2030^{1/}
(Acres by ROS Category, By Alternative)

ALTER-NATIVES	SEMI-PRIMITIVE NONMOTORIZED	SEMI-PRIMITIVE MOTORIZED	ROADED NATURAL	ROADED MODIFIED
A	24,620	2,193	351,618	396,800
NC	25,436	3,010	183,477	563,077
B & C	1,300	0	174,100	600,550
D	22,629	3,013	290,119	460,190
E & G	31,197	3,685	348,353	392,715
F	43,599	5,213	556,264	171,075
H	85,759	11,125	483,936	195,080
I	65,220	7,800	548,860	146,520

^{1/} The Bull Run will not be available for public access under any of the alternatives considered.

Figure IV-14

DISPERSED RECREATION OPPORTUNITY SPECTRUM (in Year 2030)



shown by the relative amounts of harvest, Alternatives B and C would reduce unroaded recreation opportunities much more rapidly than the other eight alternatives would. Although some alternatives allocate various unroaded areas for unroaded prescriptions, none would be able to meet total demand for Primitive and Semi-Primitive, Nonmotorized recreation opportunities.

Through expansion and improvement of the Forest trail system, users will be provided with improved, safer trails, and with new trails which will provide more recreation opportunities. Existing trails which currently have resource or safety problems will be corrected through time by all alternatives. Alternatives B, C, E, G, H, and I will bring about changes more quickly than other alternatives.

(3) Conflicts Between the Effects of the Alternatives and Others' Plans and Policies For Recreation

No conflicts are foreseen between the effects of the alternatives and others' plans and policies for recreation.

(4) Mitigation Measures For Recreation

Measures to mitigate the effects of various management activities on developed and dispersed recreation facilities and services are prescribed in Chapter 4 of the Forest Plan, and in the standards developed for individual Management Areas. Most mitigation measures are linked to the level of funding for developed and dispersed recreation facilities and services. Funding does not vary by alternative.

The effectiveness of mitigation for dispersed recreation revolves around dispersed recreation sites. Rehabilitation

of sites disturbed by logging or road construction will mitigate effects on these sites.

(5) Environmental Effects of Changes in Recreation on Other Components of the Environment

(a) Effects on Vegetation

Timber would not be available for harvest in developed recreation sites except for cutting trees prescribed in vegetation management plans. Overuse may cause loss of ground vegetation in small, localized areas of developed sites.

In the long term, areas managed for Primitive or Semi-Primitive, Nonmotorized dispersed recreation opportunities would eventually reach the climax plant succession stage. Timber would be available for harvest in Timber Emphasis Management Areas with Roaded Recreation as determined by specific prescriptions.

(b) Effects on Water Quality and Fish

In dispersed recreational areas, there is some risk of contaminating lakes and streams with human waste under all alternatives. The risks would go up as levels of use increase.

(c) Effects on Wildlife

Alternatives that would increase roaded recreation opportunities could increase wildlife harassment because access by vehicles would be expanded to new areas. Conversely, alternatives which would emphasize unroaded recreation opportunities would reduce wildlife harassment because access by vehicle would be reduced.

c. Effects of Alternatives' Activities on Wild and Scenic River Candidates

Introduction

Four rivers on the Forest have been studied for potential designation as Wild, Scenic, or Recreational Rivers under the Wild and Scenic Rivers Act. Following procedures fully described in Chapter III and Appendix E (Suitability Analysis), DEIS, 15 river segments were analyzed for suitability. The Alternatives propose nomination, or other land allocations, for entire river systems as these have been classified in the 1982 (Mt. Hood National Forest) "Interim Management Direction for Rivers with Potential for Inclusion in the National Wild and Scenic River System".

(1) Environmental Effects of Alternative Activities

The environmental consequences on rivers with potential for classification resulting from a particular alternative depend on the management activities allowed by allocations of land that impact a segment of a river if it were to be excluded from the Wild and Scenic Rivers classification by that alternative. Legislative classifications such as Wilderness, Research Natural Areas (RNA's), and minimum management requirements (MMRs) will be included in all alternatives.

MMRs have been designed to maintain viable populations of indicator species including spotted owl, pileated woodpecker, pine marten, big game, and salmonids. The required maintenance of these species would be accomplished through special habitat management. Water quality and vegetative diversity are also to be maintained. Management areas that emphasize management of a variety of Forest resources were added to the stipulations of MMRs to achieve the specific objectives established for a particular alternative. The analysis provided in this section compares an estimate of conditions that would exist under specific alternatives to conditions associated with a particular Wild and Scenic River classification.

The greatest effects on river corridors come from timber harvest and road building which vary by alternative. Three additional management activities that may affect river corridors in varying degrees include: recreational development, projects to improve fish and wildlife habitat, and special uses such as mineral development and Federal energy regulatory projects. In general, recreation and fish/wildlife habitat improvement projects may be developed in all Wild and Scenic River classifications by coordinating the design and implementation with the classification of a particular river segment. Other activities like mineral development, FERC

projects, and special uses are not predictable. Nevertheless they may cause significant environmental impacts.

Significant environmental consequences to be evaluated in this discussion are associated with changes to the following:

- Vegetation and site conditions associated with timber harvest
- Access
- Visual condition
- Shoreline development
- Recreational opportunities

Changes to the aquatic ecosystem including fish habitat and water are described in the aquatic resource section of this chapter. For a definition of each river classification type and a description of the suitable rivers, please refer to Chapter III, Proposed Wild and Scenic Rivers, DEIS.

(2) Direct Effects of Alternatives' Activities on Candidate Rivers

(a) Roaring River

Alternatives A, NC, G, E, and I recommend wild or recreational nomination of portions of the Roaring River.

Under Alternative D, the wild segment would be part of a Roaring River Special Interest Area. If this scenario were to be followed, environmental conditions would continue much like the current ones, and future designation would remain an option. Alternatives F and H propose retaining the Roaring River area as an unroaded area, and the primitive character of the wild portion of the river would be retained as in Alternative D.

Approximately 40% of the corridor along Roaring River is not suitable for timber harvest. Alternatives B and C, due to their emphasis on timber harvest, would significantly change the environment of the part inventoried as wild. Approximately 50% of the river segment would be allocated to intensive timber management. Harvesting would alter the existing vegetative conditions and produce younger age classes. Associated road building would provide access to the area and change the recreational experience from Primitive/Semi-Primitive to Roaded Natural/Roaded Modified. The primitive character of the designated river segment would be eliminated.

The quarter-mile recreation segment of Roaring River has several developments including a state highway, campground, and powerline. In Alternative B and C, increased harvest in the drainage might promote shoreline development if timber harvest roads are built near or within this segment. For Alternatives D, F, and H, the allocation of the river environment to a Special Interest Area, as in D, or to an unroaded area, as in F and H, would limit changes in the designated segment.

(b) Salmon River

This river has been divided into a recreational segment beginning at the river's headwaters, followed by a scenic segment, a wild segment, and another recreational segment leading in sequence to the Forest boundary. Six segments would be nominated for Wild and Scenic river designation under Alternatives A, NC, D, F, E, G, H, and I. About 30% of the scenic segment of the Salmon River is unsuitable for timber harvest. In the remaining alternatives, timber harvest would meet visual quality and other standards associated with management as a Scenic River.

Alternatives B and C allocate 60% of the scenic segment to intensive timber management. This level of harvest could require road building near, or within, the corridor. Vegetation would change and logging disturbances would be obvious. The effects of intensive timber harvest would change the recreation opportunities provided by Roaded Natural to Roaded Modified. The environmental consequences of these two alternatives would eliminate designation for this segment of the river as wild or scenic.

Alternatives B and C allocate 20% of the recreational area to intensive timber harvest. If harvesting were to be increased by this amount, changes to vegetation, and logging disturbances like temporary road spurs, landings, exposed soil, and downed woody material, would become evident. This would make the segment unsuitable for Recreational River designation. Timber harvest would occur in this area in the remaining alternatives, but would conform to guidelines for management of a Recreational River. The recreational segment near Timberline Lodge is unsuitable for timber harvest. At this



Hidden Falls on the Salmon River

time, the chair lifts and the major access road of the ski area are within, or near, the recreational river segment.

Existing access and visual conditions should remain the same under all Alternatives.

The wild segment of the Salmon River divides itself rather naturally into three subparts. The largest subdivision amounts to about 50% of the segment and lies within Wilderness. This area would therefore be managed according to Wilderness standards and guidelines. Another subdivision would be the upper portion, the Salmon River Meadows area, which has been mostly designated as unsuitable for timber harvest in the alternatives.

From the Salmon River Meadows to the Wilderness boundary, and from the south boundary of the Wilderness to the junction of the Salmon and South Fork of the Salmon, intensive timber management would occur on about 30% of the areas under Alternatives B and C. The overall environmental impacts of these alternatives would be to increase the evidence of timber harvest by adding access roads, changing vegetative conditions, and creating logging disturbances. New entry points created through harvest would change the dispersed/semi-primitive hiking and camping experience to a dispersed/roaded experience. Changes of this type would eliminate the option to designate this portion of the segment from designation as a wild river segment.

(c) Clackamas River

The Clackamas River has been divided into six segments that alternate between scenic and recreational classifications from its headwaters to Big Cliff. All segments have been nominated for designation as Scenic and Recreational in Alternatives D, F, G, E, H, and I.

The three scenic segments show evidence of past timber harvest. Of these three segments, approximately 40%, 10%, and 40%, respectively, are unsuitable for timber harvest. Alternatives A and NC allocate 60% of the first scenic segment, 40% of the third segment, and 40% of segment five to intensive timber management. These alternatives' levels of timber harvest would require development of access roads near, and within, some portions of the segments. Alterations in vegetative conditions would continue to produce younger age-classes. Logging disturbances would become evident in some parts of the Clackamas as temporary spur roads and landings would expose soil and harvest activities would create down woody material. Recreational experiences associated with this scenario would be Roaded Modified. Alternatives B and C allocate 60% of the first scenic segment, 50% of segment three, and 40% of segment five to intensive timber management. Harvest consequences of this alternative are the same as described

for alternatives A and NC. In all three alternatives, the river corridor

would be modified beyond an acceptable level for scenic classification.

The three recreational segments are characterized by easy access. Past timber harvest has occurred in all three recreational segments. Segments four and six have a high level of shoreline development. Segments two and four are 30% unsuitable for timber harvest and segment six is 50% unsuitable. Alternatives A and NC allocate 30% of segment two, 40% of segment four, and 10% of segment six to intensive timber management. Segments two and four would therefore be changed by increased timber harvesting, but suitable acres in the last segment (six) would be managed under extended rotations. The increased harvest chargeable to recreational segments two and four would have impacts like those previously described for the scenic segments under Alternatives A and NC. The private land at Austin Hot Springs in segment four is an exception. The present owner harvests timber and is developing the private section to allow collection of user fees.



Clackamas River

In Alternatives B and C, 40% of segment two would be allocated to intensive timber management. Comparable allocations would be 60% in segment four, and 40% in segment six. Such increased timber harvests in these two alternatives would intensify impacts like those previously described for scenic segments in alternatives A and NC. Alternatives A, B, and C modify each segment of the Clackamas so extensively they would not be eligible for a recreation classification.

(d) White River

This river has been divided into three segments beginning with scenic at the headwaters, recreational next, and wild as it approaches the Forest boundary. All

three segments have been nominated for Wild and Scenic designation in Alternative I.

Ninety percent of the scenic segment is unsuitable for timber harvest. That part of the segment tentatively suitable for harvest is either managed as not suitable or on extended rotations in Alternatives A, NC, D, F, G, E, and H. As a result, these alternatives provide conditions approximating the environment of a scenic segment of a Wild and Scenic River. Alternatives B and C allocate 10% of the scenic segment to intensive timber management. Areas of increased harvest under these two alternatives would be concentrated in the southeast, widest part of the scenic segment. Logging disturbances would therefore produce only a slight alteration of vegetation, and Forest visitors would continue to experience a landscape natural in appearance. The sector would provide Roaded Natural and Semi-Primitive, Non-motorized recreation opportunities in all alternatives.

Sixty percent of the recreational segment is unsuitable for timber harvest. The rest of this segment shows evidence of past harvest activity. The river area is now inventoried as Roaded Natural in the core and Roaded Modified on the margins. Alternatives A and NC propose 10% of the area for intensive timber management to be implemented on the margins of the corridor. Proposed harvesting would enlarge the Roaded Modified border, but evidence of logging would be minor and visual modification low. This small area of intensive harvest would be acceptable in a recreational segment of a river.

Alternatives B and C allocate 40% of the recreational area to intensive timber management. Acres to be harvested would be located throughout the segment and could require new or improved road access. Vegetative conditions would change and logging would be evident. The recreational experience would tend to Roaded Modified. This level of development would not be acceptable in a recreational segment.

In Alternatives D, E, and G, intensive timber management would be implemented in 20% of the recreational segment. The harvest area would lie in the middle and lower parts of the segment. Logging in this area would have the same effects as described in B and C.

The remaining two alternatives, F and H, propose limited to no harvesting on remaining suitable acres. These alternative activities would be appropriate for the recreational segment of a classified river.

Sixty percent of the proposed wild segment, mostly in the river core, is unsuitable for timber harvest. Alternatives A and NC propose intensive timber management on 30% of the wild area, F proposes such management for 20%, and H would intensively harvest 10%. The remainder of all suitable acres would be on extended

harvest rotations or would not be harvested, as in Alternative H. To harvest the areas proposed for timber production, access roads either near or within the corridor may become necessary. In addition, harvests would change vegetative conditions and temporarily disturb the site. While landscape considerations would generally take precedence over timber production, this level of harvest is still unacceptable in the wild segment of this river.

The other five alternatives, B, C, D, E, and G propose to allocate 40% of the segment area to intensive timber management. This level of harvest probably would require access roads either near or within the corridor. Changes in vegetation and evidence of logging activity would be evident. The recreational experience would change from Roaded Natural to Roaded Modified. The proposed levels of harvest would therefore be unacceptable in the wild segment of this river.

(3) Cumulative Effects of the Alternatives on Wild and Scenic or Recreational River Candidates

Cumulative effects of the alternatives on the four rivers are based on the rate of timber harvest. The long-term effect of harvest is modification of the landscape and the quality of recreational experiences within a river corridor. There will be a loss of Roaded Natural, Semi-Primitive Nonmotorized, and Primitive recreational experiences with allocation of a river corridor to intensive timber management.

Secondly, continued timber harvest activities would eliminate the potential to nominate a river, or a portion of it, for legislative classification as a Wild and Scenic River by altering the landscape over time. For example, modification of a river corridor classified as wild could, potentially, result in future activities that change the free-flowing nature of the river or eliminate its outstandingly remarkable features.

Generally, the alternatives that allocate significant portions of the river segments to intensive timber management, such as B and C, move the recreational setting toward Roaded Modified and eliminate the potential for future designation of river segments. None of the alternatives would produce any known cumulative effects on rivers actually designated Wild and Scenic or Recreational.

(4) Conflicts Between the Effects of the Alternatives on Others' Plans and Policies for Rivers Designated Wild, Scenic, or Recreational

Oregon has a formalized process under Oregon Statute 390.805 for designating State scenic waterways. This act nominated the initial rivers for the State system and established a process for study of candidate rivers, authorizes the condemnation of private lands through taking of property or negotiation of an easement when

necessary to protect the values of the river, and establishes a process for designating rivers as a Oregon Scenic Waterway. The alternatives have an effect on this State program since one of the rivers, the Clackamas River, recommended in the alternatives for Wild & Scenic River designation is listed as a State Waterway.

Designating a river segment as Wild, Scenic or Recreational contributes to the objectives of the Wild and Scenic Rivers Act. Such designation reduces the amount of timber to be harvested on suitable acres. Timber production would be excluded from wild segments altogether. For scenic and recreational segments, timber harvesting would be allowed as long as natural settings would be maintained or enhanced.

Alternatives that propose designation of river segments as wild, scenic, or recreational, or that would produce similar environmental conditions, reduce opportunities to achieve the timber harvest targets assigned to the Forest through the Forest Service National Program, 1980 Resources Planning Act (RPA). Alternatives most compatible with objectives established under the RPA, and the Forestry Program for Oregon, designed by the State Forestry Board, are B and C. These alternatives allocate the maximum number of suitable acres to intensive timber management but are least compatible with the criteria for wild, scenic, or recreational river segments.

The Oregon Department of Fish and Wildlife (ODF&W) has confirmed the relationship between the quality of aquatic habitat and high levels of fish populations through their programs such as the "Willamette Basin Fish Management Plan" (completed but in revision), and the "Clackamas River Basin Management Plan" (in development). The capability of riparian resources would in general be maintained at existing levels under Alternatives A, NC, B, and C. The other six alternatives propose varying levels of improvement over existing riparian conditions in the river corridors. In general, fish and wildlife habitat improvement projects will become more restricted in design and implementation in wild segments of legislatively classified rivers.

The fishery goals established by Oregon are supplemented by improvement projects on tributaries of the Columbia River funded by the Northwest Power Planning Council Columbia River Basin Fish and Wildlife Program. These projects, designed to improve anadromous fisheries habitats, are also complemented by alternatives that propose nomination of river segments for Wild and Scenic designation.

The Columbia River Basin Fish and Wildlife program contains a specific proposal to develop an anadromous fishery on White River. A feasibility study on the

proposal was completed in 1985; however its implementation was rejected by the Oregon Fish and Wildlife Commission. Alternative I would benefit the general habitat of the lower segment of the White River by maintaining it under the wild classification. Protection and improvement of the anadromous fishery on this river would benefit Indian tribal rights to dip netting at Sherar Falls.

(5) Mitigation Measures for Rivers Designated Wild and Scenic

The measures necessary to mitigate the effects of management activities on rivers designated wild, scenic, or recreational vary by classification. A wild segment designed to provide a primitive recreational experience in an unmodified environment prohibits chargeable timber harvest. In addition, facilities must be maintained or developed only to protect the wild river resource. A scenic river segment is to be managed to enhance scenery and maintain the essentially undeveloped shoreline. Timber harvest is acceptable as a method of maintaining or restoring the natural appearance of the landscape. Recreational classification of a river segment allows more modification of the natural landscape than Wild or Scenic River Classification. Harvest units would be allowed within standards that govern the size of created openings and assure the maintenance or enhancement of scenery.

The standards which have been developed for wild, scenic and recreational segments are effective in retaining the respective character of these segments.

(6) The Environmental Effects of Changes in Rivers Designated Wild and Scenic on Other Components of the Environment

(a) Effects on Vegetation

River corridors managed as wild segments would have no chargeable timber harvest. Under scenic or recreational classifications, harvest would be permitted. Wild segments will produce old growth forests in many situations. Silvicultural practices would be used to maintain and enhance the natural appearance of landscapes in scenic and recreational segments. Openings in the Forest created through harvesting would be small and designed to blend with scenery.

(b) Effects on Visual quality

Parts of rivers designated as wild or scenic segments would complement scenic viewsheds. These land allocations enhance the landscapes' natural appearance.

(c) Effects on Soils, Water Quality, Fish

River segments designated wild or scenic would have less site disturbances associated with intensive timber harvest; therefore the potential disturbance of soil and degradation of water quality would be reduced. Main-



Fishing on the Salmon River

taining riparian habitat directly benefits the fisheries resource.

(d) Effects on Wildlife

Timber management on an extended rotation would increase the amount of old growth habitat and support wildlife that depends on mature stands. However, river segments designated wild or scenic could increase visitor-wildlife interactions and increase the harassment of animals.

(e) Effects on Recreation

The designation of rivers as Wild and Scenic will provide visitors with pleasing landscapes and enhance their recreational experiences. The wild classifications would maintain acres of dispersed, unroaded recreation. Scenic and recreational classification would provide quality Roaded Natural recreational experiences.

d. Effects of Alternatives' Activities on Wilderness

(1) Direct Effects of Alternatives on Wilderness

Regardless of the alternative, public demand for recreational use of Wilderness would be expected to exceed capacity in the first or second decade. All alternatives except Alternative I have the same Wilderness land base and, therefore, the same annual 144 thousand recreation visitor days carrying capacity. The proposed designation of the Olallie Lakes Area to Wilderness in Alternative I would relieve this situation to some extent.

Wilderness use in numbers of people encounters, Wilderness use patterns and the level of funding for Wilderness management are the primary factors associated with a particular alternative. With demand for an unroaded type of recreation experience predicted to increase, the alternatives that propose roading of the existing non-

wilderness unroaded areas will more than likely precipitate increased pressure on existing Wilderness.

Development activities cause effects within Wilderness areas when the developments and Wilderness are in close proximity. Development of nonwilderness unroaded areas along the edges of Wilderness would erode the quality of Wilderness visitors' experiences. As adjacent areas would be developed, development-related impacts on some portions of Wilderness would most likely increase.

Alternatives which provide for an improved and expanded trail system can provide greater opportunities to reduce negative impacts to the Wilderness resource. This is because the trail system can be used to help distribute use, and the impacts associated with that use, from more heavily used areas to areas currently not being used or receiving little use. Wilderness users would also have a greater chance to find other locations of relative solitude.

Alternative B and C do not maintain any of the non-wilderness unroaded areas. They do, however, manage wilderness at the Full Service Level. Under these alternatives, there is less area available for a primitive or semi-primitive recreational experience. However, since demand for nonmotorized primitive type of recreation is predicted to exceed capacity there will be some negative effects from a reduced supply of unroaded areas associated with both alternatives.

Alternatives E and G maintain unroaded characteristics in four of the ten existing Non-Wilderness unroaded areas and allocate one of the ten existing unroaded areas to Unroaded Recreation management. These alternatives manage Wilderness at Full Service Level. However, since demand for nonmotorized primitive type of recreation is predicted to exceed capacity there will still be some negative effects from a reduced supply of unroaded areas associated with both alternatives. These effects may occur earlier under Alternative E since two of the unroaded areas will be entered in the first decade under this alternative, but would be entered in the second decade under Alternative G. These effects will be less with Alternatives E and G than with Alternatives A, NC, B, C, D, and F.

Alternatives H and I, which maintain all ten presently inventoried unroaded areas and manage Wilderness at Full Service Level, would exhibit the least adverse impacts on existing designated Wilderness and would maintain the expected and required quality of Wilderness recreational experience. These alternatives would tend to have less impact on Primitive and Semi-Primitive, Nonmotorized types of experiences.

(2) Cumulative Effects of the Alternatives on Wilderness

The area available for recreational use in an undeveloped setting is declining throughout the Pacific Northwest. Alternatives which cause crowding and reduce the quality of the Wilderness recreation experience on this Forest may shift use to other areas, causing similar environmental impacts there. Similarly, management of other lands that reduces their Primitive recreation opportunities may increase impacts in Wildernesses on the Mt. Hood National Forest.

(3) Conflicts Between the Effects of the Alternatives and Others' Plans and Policies for Wilderness

There are no known conflicts between the alternatives and others' plans and policies for Wilderness.

(4) Mitigation Measures for Wilderness

The measures for mitigating any adverse effects of the alternatives on Wilderness are contained in the Standards and Guidelines for the WROS (Wilderness Recreation Opportunity Spectrum) Zones.

(5) The Environmental Effects of Changes in Wilderness on Other Components of the Environment

As conditions at heavily-used Wilderness destinations become more crowded, adverse environmental impacts from visitors on soils, vegetation, aquatic resources, and riparian areas would undoubtedly increase. These effects would be especially evident in all of the alternatives except H and I to a varying degree. All but these two alternatives would displace visitors to existing Wilderness areas from unroaded areas which would be newly developed. Alternative B and C would have the greatest impact since all existing unroaded areas would be entered in these alternatives.



The Mt Hood Wilderness

e. Effects of Alternatives' Activities on Unroaded Areas

Introduction

Through a process more fully described in Appendix C, Unroaded Areas, DEIS, ten unroaded areas have been site-specifically analyzed. This analysis includes: a description of the physical and biological conditions of the area, the capability of the area for management in an undeveloped state, other resource opportunities, need for undeveloped areas, and the environmental consequences associated with each Forest Plan Alternative.

The ten remaining unroaded areas are a result of the Roadless Area Review and Evaluation (both RARE I and II), two completed unit plans (Roaring River/Salmon River FEIS, 1/74; and Eagle Creek Planning Unit FEIS, 1/75), and the Oregon Wilderness Act of 1984. The passage of the Act eliminated the need for the remaining unroaded areas to be studied for Wilderness during the first generation of Forest Plans with the exception of the Olallie Further Planning Area. However, this Congressional direction does not preclude consideration of other Non-Wilderness unroaded areas for unroaded management in the Forest Plan.

(1) Environmental Consequences of the Alternatives on Unroaded Areas

The environmental consequences associated with a given alternative are dependent on the land allocations that would apply to a specific unroaded area if not managed by a prescription that maintains its unroaded character. On the Forest, legislative classifications (Wilderness), Research Natural Areas, and minimum management requirements (MMRs) are the base for building all alternatives. MMR's are designed to maintain viable populations of wildlife indicator species: spotted owl, pileated woodpecker, pine marten, big game, and salmonids (salmon, steelhead, and resident trout) through special habitat management. In addition, water quality and vegetative diversity are to be maintained. Beyond the MMR level, additional management areas emphasizing management for a wide variety of Forest resources were added to meet the specific objectives of a given alternative. The following analysis compares the existing conditions associated with a particular unroaded area to an estimate of conditions that would exist under a specific alternative. Refer to Appendix C, Unroaded Areas, DEIS, for complete information regarding specific allocations and proposed management not detailed in this analysis.

Environmental consequences result from management activities that modify the unroaded character of an area. The most significant activities are timber harvesting and accompanying road building. Differences in rate of har-

vest and design of timber sales and transportation networks must be considered. In addition, facilities for developed recreation (e.g., ski areas) may eliminate the unroaded character. Generally, management activities such as facilities for dispersed recreation and fish and wildlife habitat improvement projects may be designed and implemented while maintaining the unroaded character of the area. Other activities, such as mineral exploration and development, hydroelectric projects, and special uses (e.g. transmission lines), may result in significant environmental consequences. While their occurrence is unpredictable, there is a discussion of the existing and potential mineral and land use activities in Appendix C. DEIS.

Alternative NC and A

Alternatives NC and A continue current management direction. Ninety percent or more of the following unroaded areas are allocated to a management prescription that harvests timber: Badger, Bull of the Woods, Mt. Hood Additions, Salmon-Huckleberry, Twin Lakes, and Wind Creek. The Badger and Salmon-Huckleberry areas will be entered in the first decade; Bull of the Woods, the Mt. Hood Additions, Twin Lakes, and Wind Creek areas will not be entered until the second decade. Thus, these areas will be developed and no longer retain unroaded qualities. They will not, in the future, be available for Wilderness designation or unroaded area management.

The Eagle and Roaring River Unroaded areas will be managed under prescriptions that maintain unroaded qualities for approximately 87% and 74% of the areas, respectively. The portions managed for timber are discrete areas proposed for entry in the second decade. Consequently, the majority of these areas would be available for future Wilderness designation and continued unroaded area management.

Greater than 90% of the Olallie and Larch unroaded areas are to be managed to retain their unroaded character. The discrete areas available for timber harvest will not be entered until the second decade. The option of Wilderness designation would, therefore, be available in the future for the vast majority of these areas also.

Alternative B and C

Alternatives B and C propose harvest of all tentatively suitable acres except for those necessary to meet the Minimum Management Requirements. Excepting Eagle, which is deferred until the second decade, all unroaded areas would be entered in the first decade. These alternatives would eliminate future Wilderness designation or unroaded area management.

Alternative D

Ninety percent or more of the following unroaded areas are allocated to a management prescription that harvests timber: Badger, Bull of the Woods, Mt. Hood Additions, Salmon-Huckleberry, Twin Lakes, and Wind Creek. Alternative D emphasizes timber production in the short term, and all areas will be entered in the first decade. Thus, these areas will no longer retain unroaded qualities. They will not, in the future, be available for Wilderness designation or unroaded area management.

The Larch and Roaring River unroaded areas will be managed under direction that will maintain unroaded qualities for approximately 60% and 75% of the areas, respectively. (The Larch percentage does not include the special interest area west of Oneonta Creek.) The portions allocated to timber emphasis are discrete areas proposed for entry in the first decade for Larch and the second decade for Roaring River. A sizeable portion of Larch and the majority of Roaring River would be available for future Wilderness designation and continued unroaded area management.

Greater than 90% of Olallie and Eagle unroaded areas are to be managed by prescriptions that retain their unroaded character. Olallie will never be entered in this alternative and the discrete areas available for timber harvest in Eagle will not be entered until the second decade. The option of Wilderness designation would, therefore, be available in the future.

Alternative F

Ninety percent or more of the following unroaded areas are allocated to a management prescription that harvests timber: Badger, Mt. Hood Additions, Twin Lakes, and Wind Creek. With the exception of Wind Creek, all areas will be entered in the first decade. Thus, these areas will no longer retain unroaded qualities. They will not, in the future, be available for Wilderness designation or unroaded area management.

This alternative emphasizes scenic landscapes in natural settings. While the Olallie unroaded area is not in a management prescription that allows timber harvesting, it will be roaded for recreational use. This development of the area will eliminate the unroaded character and potential for future Wilderness designation.

The Larch and Salmon-Huckleberry unroaded areas will be managed by prescriptions that maintain unroaded qualities for approximately 60% and 65% of the area, respectively. (The Larch percentage does not include the special interest area west of Oneonta Creek.) The portions managed for timber production are discrete areas proposed for entry in the second decade for Larch and the first decade for Salmon-Huckleberry. A size-

able portion of these areas would be available for future Wilderness designation and continued unroaded area management.

Greater than 90% of Bull of the Woods, Eagle, and Roaring River unroaded areas are to be managed in a way that retains their unroaded character. Eagle and Roaring River are never entered in this alternative and the discrete area available for timber harvest in Bull of the Woods would be entered in the first decade. The option of Wilderness designation would, therefore, be available in the future.

Alternatives E and G

Ninety percent or more of the following unroaded areas are allocated to a management prescription that harvests timber: Badger, Mt. Hood Additions, and Twin Lakes. With the exception of Twin Lakes in Alternative G, all areas will be entered in the first decade. Thus, these areas will no longer retain unroaded qualities. They will not in the future, be available for Wilderness designation or unroaded area management.

Two of the unroaded areas will be managed by prescriptions that propose timber harvest on the majority of the tentatively suitable acres. Harvest is planned for 85% and 80% of the Bull of the Woods and Salmon-Huckleberry areas, respectively. Entry is planned for the first decade in both alternatives. These unroaded areas, with the exception of the small portions proposed for unroaded management, will no longer retain unroaded qualities. There will not be an opportunity for future Wilderness designation or unroaded area management.

The Larch, Roaring River, and Wind Creek unroaded areas will be managed by prescriptions that maintain unroaded qualities for approximately 60%, 85%, and 60% of the areas, respectively. (The Larch percentage does not include the special interest area west of Oneonta Creek.) The portions allocated to timber emphasis are discrete areas proposed for entry in the first decade in Alternative E. In Alternative G, Roaring River will be entered in the first decade, and Larch and Wind Creek are proposed for entry in the second decade. A sizeable portion of all three areas would be available for potential Wilderness designation or continued unroaded area management in both alternatives.

Greater than 90% of Eagle and Olallie unroaded areas are to be managed by prescriptions that retain their unroaded character. Olallie is never entered, or roaded, in this alternative and the discrete areas available for timber harvest in Eagle would not be entered until the second decade. The option of Wilderness designation would, therefore, be available in the future.

Alternatives H and I

Alternatives H and I propose unroaded management of all the areas. These alternatives would allow future Wilderness designation and continued unroaded area management.

(2) Cumulative Effects of Each Alternative on Unroaded Areas

Cumulative effects of the alternatives on unroaded areas are twofold, based on the rate of timber harvest. The long-term effect of harvest is modification of the landscape and recreational experience within an unroaded area. These will be a loss of roaded natural, semi-primitive non-motorized, and primitive recreational experiences with allocation of an area to timber management. Secondly, harvest will, over time, eliminate the potential to designate an unroaded area, or portion thereof, for legislative classification as Wilderness.

(3) Conflicts between the Effects of the Alternatives and Others' Plans and Policies for Unroaded Areas

Management of an area as unroaded reduces the amount of timber harvest. Alternatives B and C, that allocate the maximum number of suitable acres to intensive timber management, are most compatible with the objectives of the Forestry Program for Oregon (FPFO) designed by the State Forestry Board; and the goals assigned to the Forest through the Forest Service National program, 1980 Resources Planning Act (RPA). The alternatives that maintain unroaded areas move further from achievement of target levels as described in these plans.

(4) Mitigation Measured for Unroaded Areas

The Forest Plan describes the measures necessary to mitigate the effects of management activities on unroaded areas. The intent is to provide a primitive recreational experience in an unmodified environment with no programmed timber harvesting allowed. In addition, facilities are to be maintained or developed only where needed to protect the resource.

The mitigation measures described for a particular unroaded area apply unless a more restrictive land allocation occurs. In this case, the area will be managed by the most restrictive allocation. Managing for a primitive recreational experience will effectively mitigate effects on unroaded areas.

(5) The Environmental Effects of Changes in Unroaded Areas

(a) Effects on Vegetation. Unroaded areas are not planned for regulated timber harvest. These areas may, eventually, produce climax plant communities.

(b) Effects on Visual Quality. Management of an area as unroaded will complement Scenic Viewsheds. Both

kinds of management enhance natural appearing landscapes.

(c) Effects of Soils, Water Quality, Fish, Wildlife. Maintaining unroaded areas reduces site disturbance associated with intensive timber harvest and, therefore, decreases the potential for soil disturbance and degradation of water quality. Maintenance of riparian and old-growth habitat in unroaded areas directly benefits the fisheries and wildlife resource.

(d) Effects on Recreation

Management of an area as unroaded maintains areas of dispersed unroaded recreation. This allocation provides a semi-primitive, nonmotorized (primitive) recreational experience for visitors. The elimination of some or all of the unroaded areas could have an accompanying increase in Wilderness use and cause impacts in Wilderness areas.

f. Effects of Alternatives' Activities on Special Interest Areas

Introduction

Special Interest Areas (SIAs) are places on the Forest which contain unusual scenic, historical, archeological, geological, botanical, zoological, paleontological, or other special characteristics. These areas are normally managed for recreation uses and kept in their natural condition as closely as possible. Due to the special values of these areas, they are classified under 36 CFR 294.1 to assure continuity in their special management direction.

Because each SIA has its own unique qualities, management standards and guidelines for them must be flexible yet restrict activities and uses which could be harmful. Therefore, the effects of each alternative are described in terms of:

- Areas which would be classified and managed as SIAs.
- Potential SIAs not designated as such in a particular alternative but subject to land allocations that would foreclose future opportunities for classification as an SIA. This assumes that boundaries of proposed SIAs would stay the same.

Existing SIAs include Barlow Tollgate, Columbia Gorge Old Wagon Road, Little Crater Lake, Oneonta Gorge, and Olallie Lake. Since Olallie has been designated a Further Planning Area (for Wilderness), it is not always described as an SIA.

Proposed SIAs include Face of the Columbia Gorge, Barlow Road, Larch Mountain, Roaring River, Mitchell Flats, Lost Lake, Bagby Hot Springs, Sugar Pine, Little Crater Lake Expansion, Squaw Meadows, Parkdale Lava

Beds, Olallie Lake Expansion, Clackamas Lake, Cloud Cap-Tilly Jane, and Mill Creek Buttes.

(1) Direct Effects of Alternative Activities on Special Interest Areas

Alternative NC and A

All existing SIAs would continue as such under Alternative A and Alternative NC. See descriptions of alternatives in Chapter II, DEIS. Under Unit Plans now in effect, Bagby Hot Springs, Face of the Columbia Gorge, Olallie Lake Expansion, Roaring River, Squaw Meadows, and Mill Creek Buttes would be proposed SIAs. Larch Mountain unroaded area is included in the Face of the Columbia Gorge SIA under this alternative. All other areas which could potentially be designated SIAs would lose that potential because they would be managed for timber harvest, and this would cause major alterations in vegetation. Alteration of the areas' natural environment would foreclose future possibilities of designating them SIAs.

Alternative B and C

All existing SIAs except Olallie Lake would continue as such under Alternatives B and C. All other areas which could be potentially designated SIAs would lose that potential because they would be developed for timber management.

Alternative D

All existing SIAs would continue as such under Alternative D. This alternative's SIAs include Bagby Hot Springs, Barlow Road, Face of the Columbia Gorge, Larch Mountain, Little Crater Lake Expansion, Lost Lake, Mitchell Flats, Olallie Lake Expansion, Parkdale Lava Beds, Roaring River, and Sugar Pine. All other areas which could potentially be designated SIAs would lose that potential because they would be managed for timber production.

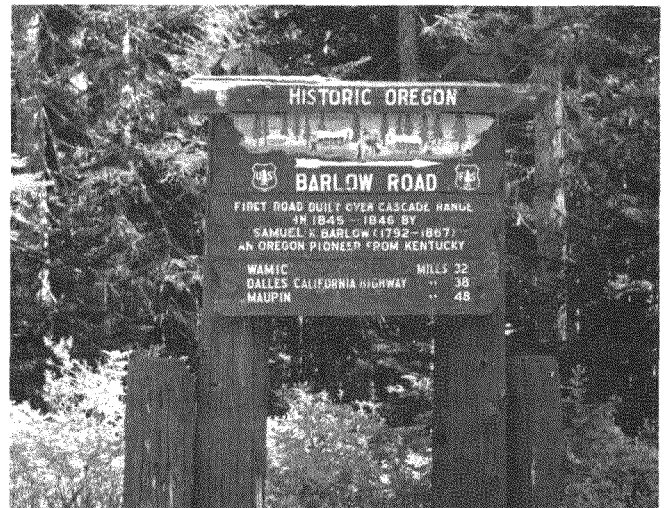
Alternative F

All existing SIAs except Olallie Lake would continue as such under Alternative F. This alternative's SIAs would include Barlow Road, Bagby Hot Springs, Face of the Columbia Gorge, Larch Mountain, Lost Lake, and Parkdale Lava Beds. Olallie Lake and its proposed expansion, Roaring River, Mitchell Flats, and Squaw Meadows would be included in the Dispersed Unroaded Management Area. This would prevent chargeable timber harvest or other major vegetational alterations in these areas. Therefore, these areas could be designated SIAs at some future date. The proposed Bagby Hot Springs SIA would be partially allocated to Dispersed Unroaded and partially allocated to Timber Emphasis Management Areas. Therefore only part of the area could be designated an SIA in the future. All other proposed SIAs would be managed to maintain their

Scenic quality. Their potential for future designation as an SIA would depend on the specific visual objectives to be met in each individual area. Viewshed management, which allows little vegetational change, would preserve the potential of future SIA designation. Changes in vegetation would eliminate the potential of future SIA designation.

Alternative G and E

All existing SIAs would continue as such under Alternatives G and E. These alternatives' SIAs would include Bagby Hot Springs, Barlow Road, Face of the Columbia Gorge, Larch Mountain, Little Crater Lake Expansion, Lost Lake, Mitchell Flats, Olallie Lake Expansion, Parkdale Lava Beds, Roaring River, Squaw Meadows, and Sugar Pine. All other areas with the potential of being designated SIAs would lose that potential under these alternatives because they would be managed for timber production.



The historic Barlow Road

Alternative H

All existing SIAs except Olallie Lake would continue as such under Alternative H. Proposed SIAs include Bagby Hot Springs, Barlow Road, Face of the Columbia Gorge, and Parkdale Lava Beds. All other areas which could potentially be designated SIAs would retain that potential since they would be managed for dispersed unroaded recreation or old growth forest characteristics. No chargeable timber harvest or other major changes in vegetation would occur.

Alternative I

All existing SIAs except Olallie Lake would continue as such under Alternative I. Proposed SIAs include Bagby Hot Springs, Barlow Road, Clackamas Lake, Cloud Cap-Tilly Jane, Face of the Columbia Gorge, Larch Mountain, Little Crater Lake Expansion, Lost Lake, Mitchell Flats, Parkdale Lava Beds, Roaring River, Squaw

Meadows, Sugar Pine, and Mill Creek Buttes. The back-country unroaded area of Olallie Lake would be recommended for Wilderness under this alternative which would foreclose any future SIA designation, however the effects on the area would be similar. This alternative proposes to designate the roaded area of Olallie Lake and its proposed expansion as an SIA.

(2) Columbia River Gorge National Scenic Area

This is not a Special Interest Area, but was established by separate legislation. It includes land that is managed by the Mt. Hood National Forest. These lands must be managed to 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.

Timber harvest will occur on lands in Category B or C Management Areas. The amount of harvest that will occur in the first decade under each alternative is included in Table IV-12.

Table IV-12

First Decade Timber Harvest by Alternative in the Columbia River Gorge National Scenic Area

ALTERNATIVE	ACRES IN NSA	MMBF
NC	405	23
A	405	23
B	3,875	221
C	4,022	230
D	1,355	78
E	310	17
F	367	21
G	228	12
H	29	2
I	79	5

(3) Cumulative Effects of the Alternatives on Special Interest Areas

No cumulative effects are known at this time.

(4) Conflicts Between the Effects of the Alternatives and Others' Plans and Policies for Special Interest Areas

No significant conflicts are known at this time. Land uses designated in the comprehensive Land Use Plan of the Warm Springs Reservation indicate that the area next to Olallie Lake on the reservation is for recreation purposes. Although the Olallie Lake area would be allocated to various management areas in the alternatives, its primary use as a recreation area is not expected to change.

(5) Mitigation Measures for Special Interest Areas

If an area is not selected for SIA designation, vegetative management techniques could be used to help mitigate any potential adverse impacts of nonselection. If the visual quality objective of retention were met in the undeveloped areas of a proposed but not selected-SIA, then the environment would be essentially managed in its natural condition. The level of development allowed in areas already developed would influence the potential designation of a nonselected SIA in the future. In summary, if management of nonselected SIAs were to follow closely the standards and guidelines for SIAs, these could be considered as mitigation measures to help offset the potential negative impacts of nonselection in an area for SIA designation.

g. Effects of Alternatives' Activities on Visual Resources

Introduction

In this section the visual condition of the Forest will be described as it should appear under each alternative. Because most visitors to the Forest identify with its specific landscapes, effects of alternative activities will be reviewed for 40 of the most popular landscapes. The term "viewshed" is used to describe an area or landscape as it would be seen from a particular travel route or area used otherwise by Forest visitors. Each viewshed receives a summary rating that describes the general impression of the landscape on a visitor passing through the viewshed. Summary ratings have been determined by the amount and type of alteration to the landscape due to management activities. Ratings are expressed as "Natural Appearing," "Slightly Altered," "Moderately Altered," or "Heavily Altered." These four ratings are explained and illustrated in the next several pages.

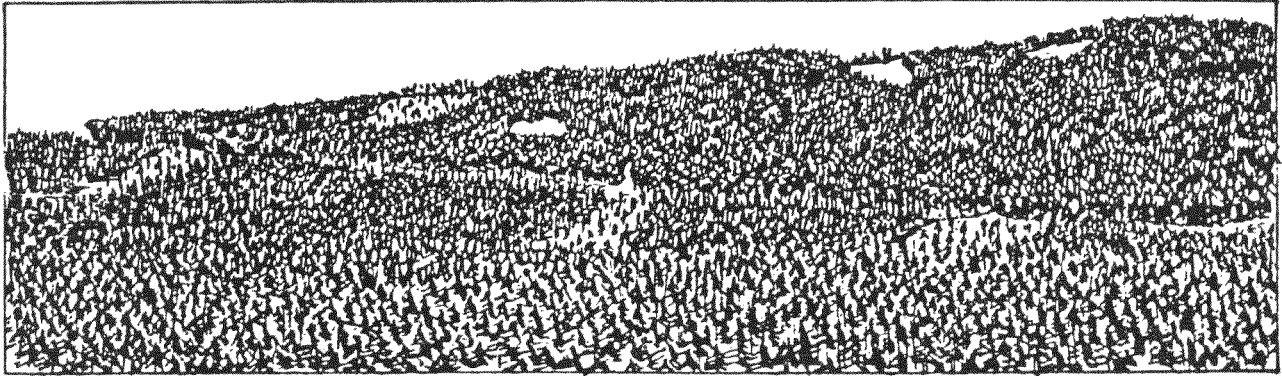
Figure IV-15, Viewshed Conditions, illustrates the ratings pictorially. Table IV-13, Visual Condition of Viewsheds, shows the present and future conditions and Table IV-14, Inventory of Acres and Number of Viewsheds by Levels of Sensitivity, shows existing inventories.

Three basic assumptions, reflected in the management direction found in Chapter Four of the Forest Plan, have been used in estimating the effects of management activities within viewsheds:

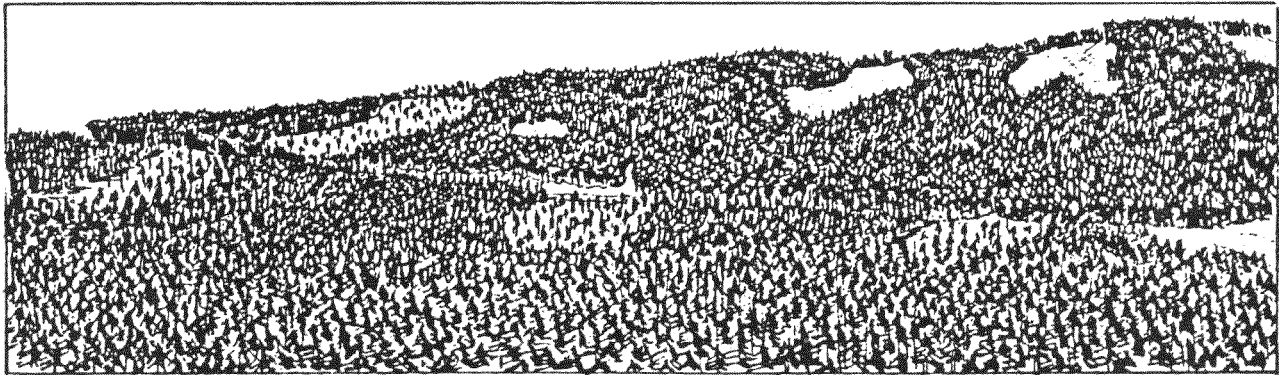
- The visual condition of the viewsheds in the future will be closely related to the amounts and types of timber harvest.
- A combination of timber harvest methods will normally be used in viewsheds. These include clear-cut and shelterwood harvest.

Figure IV-15

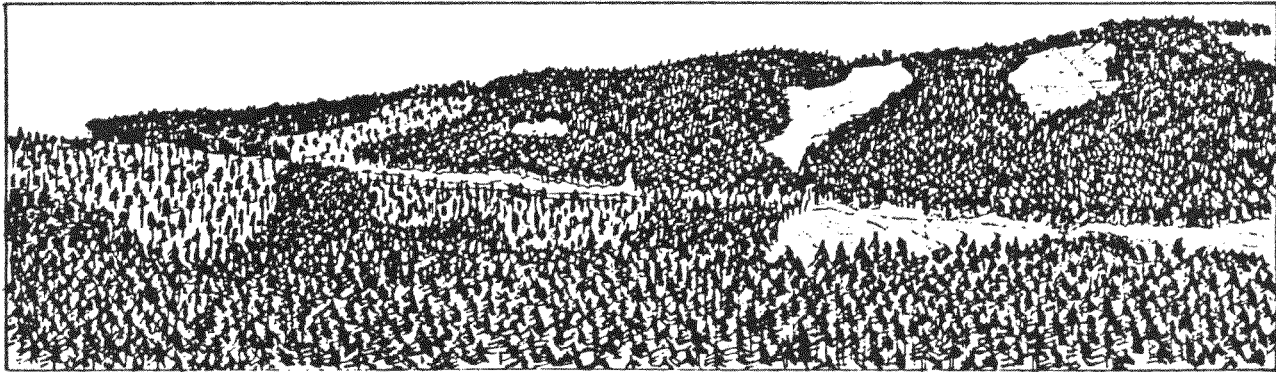
Viewshed Conditions



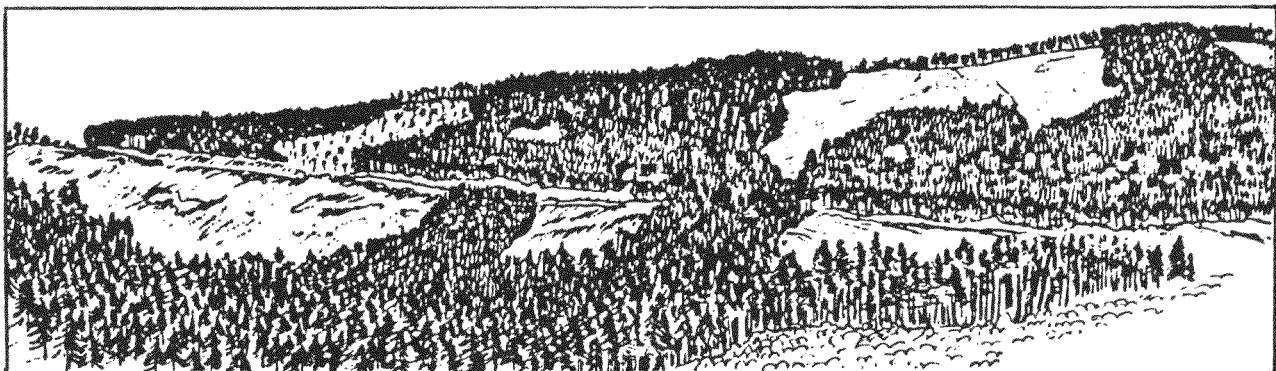
Natural Appearing



Slightly Altered



Moderately Altered



Heavily Altered

- Timber harvest units within viewsheds will be shaped to blend with the natural characteristics of the landforms.

Criteria used in determining which viewshed condition best applies to a particular landscape include the alterations or modifications described by the terms below. All percentages of alterations specify the area within a viewshed which can be seen from a ground observer's position. Illustrations of the four typical viewshed conditions precede the verbal descriptions.

1. Natural Appearing:

Less than 5% visually altered

Less than 1% altered to the visual quality level of Modification

0% altered to the Maximum Modification or Unacceptable Modification levels.

2.. Slightly Altered:

Less than 10% visually altered

Less than 5% altered to the level of Modification

Less than 3% altered to the levels of Maximum Modification or Unacceptable Modification

3. Moderately Altered:

Less than 20% visually altered

Less than 10% altered to the level of Modification

Less than 5% altered to the levels of Maximum Modification or Unacceptable Modification

4. Heavily Altered:

More than 20% visually altered at any one time.

(1) Direct Effects of Alternative Activities on Visual Quality



Mt Hood viewed from the east

Some landscapes on the Forest are more important than others for scenic enjoyment. The Forest Service Visual Management System uses three levels of sensitivity to classify the public's concern for the visual environment. Table IV-13 classifies the viewsheds of the Forest according to their sensitivity levels, as well as showing the expected Visual Conditions by alternatives.

Three management activities have the greatest impacts on forest scenery. They are timber harvest, road construction, and utility corridors. Timber harvest can severely impact visual quality because the removal of trees visually creates strong contrasts of form, line, color, and texture when compared to natural landscapes. These impacts are of most concern when seen from primary and secondary travel routes and visitor destinations. Viewsheds seen from such areas are classified as sensitivity levels one and two.

Roads create a dominating visual contrast on the steep slopes which are common on the Forest. Cuts and fills accentuate the contrasts. Utility corridors are long, wide, and usually straight clearings with high contrast to natural landscapes. Corridors on the Forest are few and will not change by alternative, but their impacts are severe and last a long time.

Table IV-15 graphically presents the expected visual condition of the Forest's viewsheds in the four levels of visual quality by alternative.

Alternative NC (No Change)

Ten of the 48 most important viewsheds would be managed in a natural appearing condition. These ten viewsheds total 81,000 acres or 7% of the total Forest, and include Columbia Gorge, Timberline, Mt. Hood Meadows, Bull Run Lake, Squaw Lakes, Elk Lake, Olallie Lakes, and Roaring River (including South Fork). Two major travel routes, Highway 26 West and Highway 35, along with the minor route Still Creek, would be managed in a slightly altered condition similar to the present appearance of these viewsheds. Four Level II viewsheds would also be managed in a slightly altered condition: Cache Meadow, Frying Pan Lake, Eagle Creek, and Palmer Peak. The total of Natural Appearing and Slightly Altered viewsheds would equal 13% of the entire Forest. This does not include the 17% of the Forest in Wilderness, which is constant in all alternatives.

All remaining viewsheds in sensitivity levels one and two would become either moderately altered (14%) or heavily altered (25%). Clearcut harvesting and road construction would be the main source of alteration, with the most severe impacts to visual quality seen on the steep slopes. Measure to mitigate these impacts could include shaping and blending of clearcut units to follow natural forms and contours of the land, and designing rights-of-way which blend into the landscape.

Table IV-13
Visual Condition of Viewsheds

PRESENT INVENTORY				EXPECTED FUTURE VISUAL CONDITIONS							
CODE #	VIEWSHED NAME	ACRES	EXISTING VISUAL CONDITION	A L T E R N A T I V E S							
				A	B&C	D	F	E&G	H	I	NC
01	COL. GORGE	30758	NA *	NA	MA	NA	NA	NA	NA	NA	NA
02	LARCH MTN.	7977	SA	MA	HA	HA	NA	NA	NA	NA	MA
04	LOST LAKE	6015	MA	MA	HA	NA	NA	NA	SA	NA	MA
05	BULL RUN LK.	6655	HA	NA	NA	NA	NA	NA	NA	NA	NA
06	UPPER HD RIV	11006	SA	MA	MA	MA	SA	SA	SA	SA	MA
07	HWY 26 WEST	16744	SA	SA	MA	SA	NA	NA	NA	NA	SA
08	LOLO PASS	13886	HA	MA	HA	HA	SA	HA	SA	SA	MA
09	TILLY JANE	4180	SA	MA	MA	MA	SA	MA	NA	NA	MA
10	HWY 35	26812	SA	SA	HA	SA	SA	SA	NA	NA	SA
11	TIMBERLINE	4671	NA	NA	MA	NA	NA	NA	NA	NA	NA
12	MT HOOD MDWS	3157	SA	NA	SA	NA	SA	NA	NA	SA	NA
13	BARLOW CREEK	14120	SA	MA	HA	MA	SA	MA	NA	NA	HA
14	DUFUR MILL R	6868	SA	MA	HA	MA	SA	SA	SA	SA	HA
15	MILL CR. RNA	3306	NA	MA	MA	MA	SA	MA	SA	SA	MA
17	BADGER LK RD	384	NA	MA	SA	SA	NA	SA	NA	NA	MA
18	TOM, DICK, & HARRY MTN	2304	NA	MA	MA	MA	SA	SA	NA	NA	HA
19	STILL CREEK	8809	NA	NA	MA	MA	NA	SA	NA	NA	SA
20	TRILLIUM LAKE	1664	MA	MA	HA	HA	NA	NA	NA	NA	MA
21	HWY 26 EAST	12542	SA	MA	HA	HA	SA	SA	NA	NA	MA
22	SALMON RIV RD	1365	SA	MA	MA	SA	NA	SA	NA	NA	MA

KEY:

NA = Natural Appearing, SA. = Slightly Altered, MA. = Moderately Altered, HA. = Heavily Altered

Table IV-13 (continued)

Visual Condition of Viewsheds

PRESENT INVENTORY				EXPECTED FUTURE VISUAL CONDITIONS							
CODE #	VIEWSHED NAME	ACRES	EXISTING VISUAL CONDITION	A L T E R N A T I V E S							
				A	B&C	D	F	E&G	H	I	NC
24	UPPER SALMON	2538	SA	MA	HA	MA	NA	MA	NA	NA	HA
25	HOOD RIVER	14419	HA	HA	HA	HA	MA	HA	MA	SA	HA
26	PARKDALE LAVAS	1344	SA	NA	NA	NA	NA	NA	NA	NA	MA
27	ALDER CREEK	4885	NA	HA	HA	HA	SA	HA	MA	SA	HA
29	BULL RUN RNA	341	NA	NA	NA	NA	NA	NA	NA	NA	NA
30	SQUAW LAKES	661	NA	NA	NA	NA	NA	NA	NA	NA	NA
31	SKYLINE RD-NOR	2645	SA	MA	HA	HA	SA	HA	NA	SA	MA
32	HWY 216	1429	NA	HA	HA	HA	SA	SA	NA	SA	HA
33	TIMOTHY LAKE	15656	MA	MA	HA	HA	SA	SA	NA	SA	MA
34	ROCK CREEK RES	2432	MA	HA	HA	SA	SA	SA	NA	SA	HA
35	BARLOW ROAD	3669	NA	HA	HA	SA	SA	SA	NA	SA	HA
36	LWR CLACK RIV	28881	MA	MA	MA	SA	NA	NA	NA	NA	MA
37	UPR CLACK RIV	29179	HA	MA	HA	MA	SA	SA	NA	SA	HA
38	HOT SPRINGS FK	6164	HA	MA	HA	SA	NA	NA	NA	NA	MA
39	UPPER PANSY CR	1578	HA	HA	HA	HA	NA	HA	NA	NA	HA
40	DICKEY CREEK	1194	HA	MA	MA	MA	NA	MA	NA	NA	HA
41	ELK LAKE	1237	HA	NA	MA	SA	NA	MA	NA	NA	NA
42	RHODO RIDGE	4074	HA	HA	HA	MA	SA	MA	NA	SA	HA
43	BULL O'WOODS	8745	HA	MA	MA	MA	SA	MA	SA	SA	HA
44	BERRY CREEK	3605	HA	HA	HA	HA	SA	HA	MA	SA	HA

KEY:

NA = Natural Appearing, SA. = Slightly Altered, MA. = Moderately Altered, HA. = Heavily Altered

Table IV-13 (continued)

Viewshed Conditions

PRESENT INVENTORY				EXPECTED FUTURE VISUAL CONDITIONS							
CODE #	VIEWSHED NAME	ACRES	EXISTING VISUAL CONDITION	A L T E R N A T I V E S							
				A	B&C	D	F	E&G	H	I	NC
45	OLALLIE LAKE	10729	NA	NA	NA	NA	NA	NA	NA	NA	NA
46	OLALLIE CREEK	8063	HA	MA	HA	MA	SA	MA	NA	NA	HA
47	SO FK ROARING	5418	NA	NA	MA	NA	NA	NA	NA	NA	NA
48	ROARING RIVER	17789	NA	NA	MA	NA	NA	NA	NA	NA	NA
49	WHETSTONE CR	1770	HA	HA	HA	HA	NA	HA	NA	NA	HA
50	RHODO MEADOW	8532	HA	HA	HA	HA	MA	HA	HA	MA	HA
51	OAK GROVE FK	10345	MA	MA	HA	MA	SA	SA	NA	SA	HA
53	BAGBY HOT SPR	1920	SA	MA	MA	MA	NA	NA	NA	NA	MA

KEY:

NA = Natural Appearing, SA. = Slightly Altered, MA. = Moderately Altered, HA. = Heavily Altered

Alternative A (No Action)

Twelve of the 48 most important viewsheds would be managed in a natural appearing condition. These viewsheds total 92,000 acres or 8% of the total Forest and include Columbia Gorge, Timberline, Mt. Hood Meadows, Olallie Lakes, Still Creek, Roaring River (including South Fork), Bull Run Lake, Squaw Lakes, Elk Lake, and Parkdale Lava Beds. Two major travel routes, Highway 26 west and Highway 35, would be managed in a slightly altered condition similar to the present appearance of these viewsheds. Two more Level I Viewsheds, Lost Lake, Badger Lake Rd., and three level II viewsheds would also be managed in a slightly altered condition: Thunder Mtn., Lower White River, and Palmer Peak. The total of Natural Appearing and Slightly Altered Viewsheds would equal 14% of the entire Forest. This does not include the 17% of the Forest in Wilderness which is constant in all alternatives.

All remaining viewsheds in sensitivity levels one and two would become either moderately altered (28%) or heavily

ly altered (9%). Clearcut harvesting and road construction would be the main source of alteration, and where these activities would take place on steep slopes the impacts to visual appearances would be severe. Measures to mitigate these impacts could include shaping and blending of clearcut units to follow natural forms and contours of the land and designing rights-of-way which blend into the landscape.

Alternative B

Only one percent of the Forest located in five of the 48 most important viewsheds would be managed in a Natural Appearing condition. The five viewsheds are Parkdale Lava Beds, Olallie Lakes, Squaw Lakes, Bull Run Lake, and Bull Run Research Natural Area.

Mt. Hood Meadows, Badger Lake Road, in Level 1, and Thunder Mountain, and Lower White River in Level 2 would be managed in a Slightly Altered condition. These viewsheds equal another 1% of the Forest.

Sixteen of the most heavily traveled routes and use areas, totalling 13% of the Forest, would become

Table IV-14

Inventory of Acres and Number of Viewsheds by Levels of Sensitivity¹

LAND CATEGORY	ACRES	PERCENT OF FOREST
DESIGNATED WILDERNESS ¹	185,300	17
LEVEL I (highest sensitivity)		
40 Viewsheds seen as foreground and middleground	334,558	30
6 Viewsheds seen as background	44,260	4
2 Research Natural Areas	3,647	<1
Total Level I	382,465	34
LEVEL II (average sensitivity)		
37 Viewsheds seen as foreground	173,371	16
1 Viewshed seen as background	9,364	1
Total Level II	182,735	17
LEVEL III (lowest sensitivity)		
Non-Viewsheds, i.e. forest lands which are seldom seen	347,316	32
Total Level III	347,316	32
Total Forest (National Forest Lands only)	1,059,400	100%

^{1/} Viewsheds do not include wilderness

Moderately Altered due to timber harvest. Viewsheds in this category include the Columbia Gorge, Timberline Road, Highway 26, Lower Clackamas River, Bagby Hot Springs, Roaring River, Tilly Jane, Hood River, and others.

Timber harvest would modify the remaining 25 Level 1 viewsheds including such familiar travel routes as Lost Lake, Highway 35, Trillium Lake, Timothy Lake, Highway 26 East, Highway 216, Barlow Road, and others adding up to 19% of the Forest to Heavily Altered.

Together with the Level 2 viewsheds, and the nonviewsheds, a total of 81% of the Forest would be either moderately or heavily altered under this alternative. Only classified Wilderness and some areas unsuitable for timber production would be left in a Natural or Slightly Altered visual condition.

Alternative C

Only seven Level 1 and two Level 2 viewsheds, totalling 2% of the Forest, would be managed in a Natural Appearing or Slightly Altered condition. This is the lowest

level of visual quality provided by any alternative under consideration. Timber harvest would visually impact virtually the entire Forest, including major and minor travel routes, with the exceptions of the 17% Wilderness, and nine viewsheds: Mt. Hood Meadows, Parkdale Lava Beds, Bull Run Natural Area, Squaw Lakes, Olallie Lakes, Elk Lake, Badger Lake Road, Thunder Mountain, and Lower White River. In short, 82% of the Forest would become moderately or heavily altered.

Alternative D

Of the 48 Level 1 viewsheds, this alternative would manage 11 in a Natural Appearing condition. Another 9 of the 48 would be managed as Slightly Altered, as would five Level 2 viewsheds. Altogether, 17% of the Forest would be Natural Appearing or Slightly Altered including such locations as Columbia Gorge, Lost Lake, Timberline Road, Mt. Hood Meadows, Roaring River in Natural Appearing condition. Highway 26 West, Highway 35, Salmon River Road, Barlow Road, Lower Clackamas River, and Hot Springs Fork would be classified as Slightly Altered.

Table IV-15

Expected Visual Condition by Alternatives and by Percent of the Forest

	EXISTING VISUAL CONDITION 1979	^{3/} VMS	NC	A	B	C	D	G&E	F	H	I
Wilderness ^{1/}	17%	17	17	17	17	17	17	17	17	17	17
Natural Appearing											
Lev 1	9%	5	7	8	2	2	8	14	15	27	20
Lev 2	2%	0	0	1	0	0	0	0	3	5	6
Slightly Altered											
Lev 1	10%	27	5	4	<1	<1	8	12	17	5	13
Lev 2	3%	0	1	1	<1	<1	1	1	8	6	10
Moderately Altered											
Lev 1	6%	3	11	19	14	14	11	4	2	2	1
Lev 2	3%	16	3	9	4	4	7	7	6	5	1
Heavily Altered											
Lev 1	10%	0	12	3	19	19	8	5	0	1	0
Lev 2	9%	0	13	6	12	12	8	8	0	0	0
Non- Viewshed ^{2/}	32%	32	32	32	32	32	32	32	32	32	32
TOTALS	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

1/ Acres in viewsheds do not include Wilderness acres. It is assumed that Wilderness will be Natural Appearing.

2/ It is assumed that Nonviewshed areas will be heavily altered.

3/ Visual Management System. Figures represent inventory of desired visual conditions.

Fifteen Level 1 viewsheds including Hood River, Tilly Jane, Dufur Mill Road, Still Creek, Upper Clackamas River, Oak Grove Fork, and Bagby Hot Springs would become Moderately Altered accompanied by 16 Level 2 viewsheds. Areas in this visual quality would total 18% of the Forest.

Of the remaining viewsheds, 13 in Level 1 and 16 in Level 2 would be heavily altered by timber harvest. This would represent 16% of the Forest and include such areas as Larch Mountain, Lolo Pass, Trillium Lake, Highway 25 East, Skyline Road, Highway 216, and Timothy Lake.

Alternative F

Under this alternative, 24 of the 48 Level 1 viewsheds, and 8 Level 2 viewsheds, equalling 18% of the Forest, would be managed in a Natural Appearing condition. Another 22 of the 48 Level 1 viewsheds plus 21 Level 2 viewsheds would be managed in a Slightly Altered condition. Altogether 43% of the Forest would be managed in Natural Appearing or Slightly Altered conditions.

Only two Level 1 viewsheds, Hood River and Rhododendron Meadow, would be Moderately Altered, and these are normally observed at a distance of more than four miles; i.e. background. Nine of the 38 Level 2 viewsheds would also be Moderately Altered. No viewsheds would be Heavily Altered over the long term even though there are now 14 viewsheds in that condition. This alternative would permit all 14 to recover to more natural vegetation through natural growth or rehabilitation actions.

Alternatives G and E

Seventeen of 48 Level 1 viewsheds plus one Level 2 viewshed would be managed for a Natural Appearing condition. This would amount to 14% of the Forest. An additional 14 of the 48 Level 1 viewsheds plus 6 Level 2 viewsheds would be managed for a Slightly Altered condition. Altogether, these alternatives would maintain 27% of the Forest in a Natural Appearing or Slightly Altered condition. Natural Appearing areas include Columbia Gorge, Lost Lake, Bull Run Lake, Timberline Road, Mt. Hood Meadows, Squaw Lakes, Hot Springs Fork, Olallie Lakes, and Roaring River. Slightly Altered areas include Highway 26 West, Highway 35, Still Creek, Salmon River Road, Barlow Road, and Lower Clackamas River. This would represent little change from the present visual conditions under current management prescriptions for these areas.

Nine of the 48 Level 1 viewsheds plus 19 Level 2 viewsheds equalling 11% of the total Forest would become Moderately Altered. Areas would include Tilly Jane, Barlow Creek, Dickey Creek, Elk Lake, and Upper Salmon river.

Timber harvest would change the remaining 8 Level 1 viewsheds along with 15 Level 2 viewsheds into a Heavily Altered condition. These areas, totalling 13% of the Forest, would include Lolo Pass, Skyline Road (N), Mud Creek, Little Badger Creek, Linney Creek, and Jordan Creek.

Alternative H

To provide a high level of visual quality, 38 of the 48 Level 1 viewsheds plus three Level 2 viewsheds would be managed for a Natural Appearing condition. These areas total 32% of the Forest. Another 6 of the 48 plus 11 Level 2 viewsheds would be managed for a Slightly Altered condition. Altogether, 43% of the Forest would be managed for a Natural Appearing or Slightly Altered condition.

Only 3 Level 1 viewsheds would be Moderately Altered, and these would be seen at a distance of more than four miles. Twelve of the 38 Level 2 viewsheds would also be Moderately Altered for a total of 7% of the Forest.

Two viewsheds, Rhododendron Meadow and Gordon Creek, would become Heavily Altered. This would not materially change their present condition.

Alternative I

For a maximum in high-quality scenery, this alternative would manage 30 of the 48 Level 1 viewsheds plus 16 Level 2 viewsheds in a Natural Appearing condition. This would represent 26% of the entire Forest.

Seventeen Level 1 and 21 Level 2 viewsheds would be managed in a Slightly Altered condition. This would total an additional 23% of the Forest. Only two viewsheds, Rhododendron Meadow and Road 48 would become Moderately Altered (2%), and none would be Heavily Altered. However, 32% of the Forest not identified for scenic value would be expected to become Heavily Altered.

(2) Cumulative Effects Of Each Alternative On Visual Resources

The cumulative effects of activities on visual resources under the various alternatives are closely tied to the rate of timber harvest in the sensitive viewsheds. In viewsheds not shown on the alternative maps as Management Area B2 (Scenic Viewshed), and scheduled for timber harvest, the long term cumulative effects would be a change from a landscape with a natural appearance to one with an altered appearance.

The rate of harvest which would retain or partially retain the natural character of the landscape was tested by computer modeling in 1981. (For more information, see Siskiyou National Forest, "Scheduling Timber Harvest to Meet Visual Quality Objectives", 1981.) This study considered slope, logging systems, harvest schedules, and

regrowth of new trees to find the percentage of a viewshed which could be "disturbed" at one time and still meet the visual quality objectives. While those results would require adjustment for differing conditions on similar forests, harvesting even at normal rates does not generally allow enough time for the regrowth to maintain the typical forest vegetative character. Such harvests therefore have cumulative impacts on scenery.

Alternative I would have the least cumulative effects on the scenery. Nearly all of the viewsheds rated high to medium in sensitivity (48% of the Forest) would be either Natural Appearing or Slightly Altered.

Alternatives B and C would have the greatest long term cumulative effects on scenery. Only 2% of the Forest outside of Wilderness would be managed in a Natural Appearing or Slightly Altered condition.

Alternatives F and H would have relatively minor cumulative effects on the important viewing areas, with 43% of the Forest in a Natural Appearing or Slightly Altered condition.

Alternatives A, NC and D would have moderate to high cumulative effects resulting in 14% of the Forest maintaining a Natural Appearing or a Slightly Altered condition by the fifth decade.

Alternatives G and E would have low to moderate cumulative effects on scenery. While providing 27% of the Forest in Natural Appearing or Slightly Altered conditions, these alternatives would also harvest timber in 17 of the highest sensitivity viewsheds at an accelerated rate. Of the total Forest acreage, a constant 32% not inventoried as scenic viewsheds would be Heavily Altered in all alternatives. Separately, 17% of the Forest designated as Wilderness would remain in an undisturbed visual condition.

On private lands adjoining the Forest, timber harvest has occurred and is expected to continue. Private land owners are not expected to change their land management activities to maintain or enhance visual quality; therefore, there will be cumulative impacts on Forest viewsheds where the private lands are seen from resorts, communities, and primary travel routes like Highway 26, Highway 35, and Lolo Pass Road.

(3) Conflicts Between the Effects of the Alternatives and Others' Plans and Policies for Visual Resources

Highway 26 has been designated a Scenic Roadway by the State of Oregon, and this measure controls advertising along this route. Clackamas County has designated several routes as Scenic Roadways including Highway 26, Highway 35, Truman Road, Lolo Pass Road, Salmon River Road, Timberline Road, West Leg Road, and Old Highway 35. (For additional information, consult

CH2M/HILL, Clackamas County Planning Dept., "Mt. Hood Community Plan", December, 1976.)

The Multnomah County Comprehensive Plan contains an overlay zone for areas of "significant environmental concern." This zone applies to the Columbia River Gorge within Multnomah County. One of the environmental concerns is scenery.

The Hood River County Comprehensive Plan contains objectives and policies which recognize the scenic and historic values in the Columbia River Gorge. These are intended to control developments on private lands in the Gorge within Hood River County to insure compatibility with natural values.

While the State of Oregon and its counties do not have jurisdiction over federal lands, some of the Forest Plan alternatives, specifically B and C, would apparently generate conflicts with scenic road/scenic area policies of the counties by converting certain viewsheds from Natural Appearing and Slightly Altered to a Moderately or Heavily Altered visual condition.

(4) Mitigation Measures for Visual Resources

Measures available to reduce the impact of various land management activities have been fully described in several Visual Resource Management Handbooks published by the USDA Forest Service, and located in National, Regional, Supervisor, and District offices. These handbooks are specific regarding mitigation of individual land uses, such as timber management, roads, range management, utilities, ski areas, and others.

The Forest Plan will contain Forest-wide and Management Area standards which establish visual quality objectives for the various Management Areas. The Plan will also provide resource-specific guidance on how to achieve Forest management objectives. In effect, the principles of design will be used to integrate all of the various land management activities with the character of the natural landscape. The intensity of this effort is intended to strike a balance between other uses of the land, the costs of mitigation, and the relative importance of the visual resource in each particular area. Examples of the application of the principles of visual resource management since 1970 can be observed in the Highway 26 and Timothy Lake viewsheds. The effectiveness of mitigation measures for visual resources is clearly shown in these viewsheds, where timber management is practiced with relatively minor impacts on visual quality.

(5) The Environmental Effects of Changes in Visual Resources on Other Components of the Environment

(a) Vegetation

Timber stands managed for visual objectives should have longer rotation ages than normal, and this would produce larger trunk diameters. In the foreground of viewshed management areas, that is, from zero to 1/4 mile away from the observer, dominant trees would grow to an average size of 32 inches before being harvested on a 250 year rotation. In the middleground, 1/4 mile to 4 miles, stands would be harvested on a 125 year rotation, equivalent to a proxy for a limit on the percentage of area to be visually disturbed at one time. These harvest limitations reduce the maximum timber output of the land in order to gain aesthetic benefits.

(b) Water quality

Scenic viewsheds and riparian areas are compatible. Both require reductions in disturbances which reduce the risk of degrading the quality of water. However, where vegetation management is used to retain or partially retain the landscape character, the impacts on water quality would be similar to those in normal timber management although predictably less severe. The lesser effects are due to reductions in the area harvested per decade in scenic viewsheds.

(c) Effects on Soils

The effects on soils are approximately the same as the effects on water quality.

(d) Effects on Fish

The effects on fish are approximately the same as the effects on water quality.

(e) Effects on Wildlife

Managing for visual quality objectives would increase the amount of habitat available for wildlife species that depend on mature stands, as compared to areas where the timber is harvested at an earlier age under normal procedures. This result would be due to extended rotations, larger tree sizes, and constraints on the amount of an area disturbed at any one time.

(f) Effects on Recreation

Viewing attractive forest scenery is classified as a recreational activity, and it is one of the higher recorded uses of the Forest. Managing the important viewsheds for visual resource values would enhance the recreational experiences of visitors in viewshed areas.

h. Effects of Alternatives' Activities on Cultural Resources

Introduction

Standards and guidelines of the Forest provide for the inventory, evaluation, protection, and enhancement of cultural resources under all alternatives. However, management activities always risk disturbing previously unidentified sites of cultural value, or sites whose significance is not recognized. Cultural resources may be directly disturbed, perhaps destroyed, by project activities. Examples include destruction or displacement of surface remains such as prehistoric hearth rings or the ruins of historic log cabins. Stone tools or glass bottles can easily be removed or displaced. Interpretation of a site's function and use by those who occupied it relies to a great extent on the relative placement of individual artifacts. Therefore displacement or loss of such artifacts can make it impossible for scholars to develop substantive information from the site. Cultural resources may also be disturbed indirectly from project activities which provide easier access to the site and lead to vandalism or illicit collection of valuable relics. Other indirect, adverse impacts include increased erosion or decomposition of a site through removal of its protective cover.

Current rates for conducting cultural resource inventories, the rates of site discoveries, and the number of sites which may be potentially damaged by activities provide information to prepare rough estimates of the relative impact of each alternative on cultural resources. Adverse project impacts and the required mitigation of those impacts can be assumed to cause the ultimate loss of the site from the cultural resource data base. A point to remember is that cultural resources are nonrenewable. Once removed, they can never be replaced.

This discussion of cultural resources assumes that projects would always enter new areas rather than re-enter places previously inventoried to determine the rate of inventory and resource conflicts. Areas such as Wilderness, Special Interest Areas, Research Natural Areas, and unroaded areas would remain largely uninventoried for cultural resources until lands involved with more active management activities had been inventoried. Until data are gathered from these areas, which often have radically different environments compared to the rest of the Forest, our knowledge of the cultural resource data base and its variability will remain incomplete and possibly biased.

None of the alternatives would deny Native Americans access to areas of traditional or religious significance. However, various alternatives would make access to specific resource areas either more difficult or easier.

The amounts of land allocated to various management strategies would influence the potential availability and supply of traditional or religious resources.

(1) Direct Effects of the Alternatives on Cultural Resources

Alternative NC After the first decade of management prescribed by this alternative, roughly 17% of the recorded cultural resources would be affected by project impacts and required mitigation. Potentials for unintended damage without mitigation would increase. Mitigation would recover important scientific data previously unavailable. Resource conflicts would increase at a faster rate than presently experienced. Very few sites would be interpreted for public enjoyment and enlightenment. The availability of traditional or religious Native American resources would continue to diminish. Coordination with local Indian tribes would remain sporadic.

Alternative A According to rough estimates, about 5% of the recorded cultural resources would be affected by project impacts and required mitigation after the first decade of management under this alternative. Potentials for inadvertent damage without mitigation would increase. Mitigation would recover important scientific data previously unavailable. The rate of resource conflicts would increase over time. Very few sites would be interpreted for public enjoyment. The availability of traditional or religious Native American resources would continue to diminish. Coordination with local Indian tribes would remain sporadic.

Alternative B After the first decade of management prescribed by this alternative, roughly 12% of the recorded cultural resources would be affected by project impacts and required mitigation. Potentials for unintentional damage without mitigation would increase. Mitigation would recover important scientific data previously unavailable. Resource conflicts would increase at a faster rate than now experienced. Very few sites would be interpreted for public enjoyment and enlightenment. Opportunities for increasing the availability of traditional or religious Indian resources would be greatly increased. A systematic method of coordination with local Indian tribes would be needed.

Alternative C After the first decade of management under this alternative, roughly 19% of the recorded cultural resources would be affected by project impacts and required mitigation. Potentials for unintended damage without mitigation would increase. Mitigation would recover important scientific data previously unavailable. Resource conflicts would increase at a much faster rate than presently experienced. The opportunity for increasing the availability of traditional or religious Indian resources would be greater than under any other alterna-

tive. A systematic method of coordination within local Indian tribes would be needed.

Alternative D After the first decade under this alternative, roughly 8% of the recorded cultural resources would be affected by project impacts and required mitigation. The potential for inadvertent damage without mitigation would increase. Mitigation would recover important scientific data previously unavailable. Resource conflicts would increase at a faster rate than now experienced. Several significant sites would probably be interpreted to increase public awareness of the national heritage. The opportunity for increasing the availability of traditional or religious Indian resources would be greater than now available. A systematic method of coordinating with local Indian tribes would be needed.

Alternative E After the first decade of management under this alternative, roughly 6% of the recorded cultural resources would be affected by project impacts and required mitigation. Potentials for accidental damage without mitigation would increase. Mitigation would recover important scientific data previously unavailable. Resource conflicts would decrease slightly from the present rate. Several significant sites would probably be interpreted to increase public awareness of the national heritage. Opportunities for increasing the availability of traditional or religious Indian resources would be recognized. Coordination with local Indian tribes on managing these resources would be needed.

Alternative F After the first decade of management under this alternative, roughly 1% of the recorded cultural resources would be affected by project impacts and mitigation. The potential for unintended damage without mitigation would increase. Mitigation would recover important scientific data previously unavailable. Resource conflicts would greatly decrease from the present rate. Several significant sites would probably be interpreted for public enjoyment. The availability of traditional or religious Indian resources would greatly diminish from current supplies. Coordination with local Indian tribes on managing such resources would be limited.

Alternative G After the first decade of management under this alternative, 4% of the recorded cultural resources would be affected by project impacts and mitigation. The potential for unintended damage without mitigation would increase. Mitigation would recover important scientific data previously unavailable. Resource conflicts would decrease somewhat from the present rate. Several significant sites would probably be interpreted for public enjoyment and enlightenment. The opportunity for increasing the availability of traditional or religious Indian resources would exist. Coordination with local Indian tribes would be needed.

dination with local Indian tribes on managing these resources would be needed.

Alternative H After the first decade of management under this alternative, virtually none (less than .01%) of the recorded cultural resources would be affected by project impacts and required mitigation. However, the potential for unintended damage without mitigation would still increase, though to a lesser extent than in the more commodity-oriented alternatives. Mitigation would recover important scientific data previously unavailable. Resource conflicts would increase at an extremely slow rate. Few sites would be interpreted for public enjoyment and enlightenment. The availability of traditional or religious Indian resources would greatly diminish from the current supply. Coordination with local Indian tribes on managing such resources would be very limited.

Alternative I After the first decade of management under Alternative I, somewhat less than 1% of the recorded cultural resources would be affected by project impacts and mitigation. The potential for unintended damage without mitigation would still increase. Mitigation would recover important scientific data previously unavailable. Resource conflicts would decrease greatly from the present rate. A number of significant cultural resources would be interpreted for public enjoyment and enlightenment. The availability of traditional or religious Indian resources would greatly diminish from current supplies. Coordination with local Indian tribes on managing such resources would be limited.

All Alternatives - Summary Ranking From the viewpoint of which alternative best protects cultural resource values, and which has the greatest potential for increasing the supplies of traditional or religious Indian resources, the alternatives can be ranked from best to worst:

Protection of Cultural Resource Values	Potential for Increasing Traditional or Religious Indian Resources
H (Best)	C (Best)
I	B
F	D
G	E
E	G
A	NC
D	A
B	F
NC	I
C	H

(2) Cumulative Effects of the Alternatives on Cultural Resources

As major projects such as timber sales continue through the years, the available land base, in which to relocate those projects (or a portion of them) to avoid a cultural resource site, will continue to decline. This will produce a growing number of potential impacts to cultural resources. Such direct impacts would have to be mitigated by recovering the data the site contains or documenting the site to specific standards. This could recover some or most of the data the site contains. Alternatively it could provide a paper record of its appearance. Neither would prevent the loss of the site for future study or public enjoyment. There is no adequate compensation for the loss of some sites. Some are aesthetically and emotionally significant, and they convey by their preservation where they lie a special link with the past for both Native American and other communities. For some sites with national values, such as Timberline Lodge or the Barlow Road, their loss would reduce America's national heritage.

Cultural resource values may undergo cumulative reduction by the lack of maintenance of historically significant buildings through natural weathering, deterioration, erosion, or vandalism through lack of adequate security. Buildings in use can be kept in good condition as long as the users continue to maintain the structures. If, however, maintenance isn't undertaken with sensitivity to the historic characteristics of the buildings, the cultural values lost would be the same as though the building were lost for other reasons.

Resource values have already been lost to a large degree for such traditional or religious Indian resources as huckleberries. This reduction has taken place since the early 1900's when many of the more productive huckleberry fields were enhanced by past forest fires. Fire suppression measures have resulted in new tree growth that has shaded the huckleberries and reduced productivity. If enhancement measures are not undertaken to restore or increase huckleberry production, supplies will continue to decline. They need not be lost entirely, however, since huckleberries survive as an understory vegetation in many of the Forest's higher elevations.

(3) Conflicts Between the Effects of the Alternatives and Others' Plans and Policies for Cultural Resources

The Oregon State Historic Preservation Office is in the early stages of preparing a Statewide Comprehensive Historic Preservation Plan. No conflicts have been noted between the Forest's cultural resource management and the draft Statement. Management of the Forest will be coordinated with the final State plan.

The land uses designated in the Comprehensive Land Use Plan of the Warm Springs Reservation are entirely compatible with the present management of Forest lands adjacent to the Reservation. Those lands designated as forest on the Reservation are adjacent to lands on the Forest currently managed for timber production. The lands designated as recreation on the Reservation are adjacent to the Olallie Lakes area on the Forest. This area is currently being managed as a Special Interest Area with emphasis on recreation and scenic values. The lands designated as Wilderness on the Reservation are adjacent to the Mt. Jefferson Wilderness on the Forest. The coordination of Forest activities with the Confederated Tribes is a Forest policy that will be maintained. Coordination in managing of fisheries habitat between the two agencies is very close because a number of streams originating on the Forest flow into the Warm Springs Reservation.

(4) Mitigation Measures For Cultural Resources

Mitigation most often involves the use of methods and techniques to minimize disturbances to cultural resources and their environmental settings. A variety of potential mitigation measures are available. Their use will depend on the physical nature of the resource, the potential project impact, and other factors. Mitigation may range from special project design criteria to be followed during project activities, to protective enclosures around sites, and to systematic monitoring of project activities by specially trained personnel. Each would require further consultation with the State Historic Preservation Officer and the Advisory Council on Historic Preservation if the resource is determined eligible to the National Register of Historic Places. The most desirable measures, of course, are those which effectively protect the cultural resource in place, are economically sound, and are compatible with other management needs.

The major types of cultural resource mitigation which the Forest has used, and will continue to use, include:

1. Avoidance: an example is the adjustment of project boundaries which eliminate any physical damage to the cultural resource. Another example is the use of protective physical/visual buffers between the site and the surrounding area of project impact. This is currently the most frequently used measure and the most effective of the measures discussed.

2. Special protective techniques: one example is the yarding of logs by means of predesignated skid roads. Other examples are the directional felling of timber, full-suspension yarding of logs above the surface, and over-snow logging. These measures can be almost as effective as avoidance if properly carried out and if conditions are favorable for a successful completion. However, field conditions can change rapidly (such as snow depth),

causing some site damage before activities are halted (Marvin, Susan H., 1982, Philipe, Frances M., 1985).

3. Special construction methods for historic structures: a basic example is the use of historically accurate or compatible materials in the repair or rehabilitation of existing structures done in keeping with the Secretary of the Interior's "Standards for Rehabilitation and Guidelines for Rehabilitating Historic Buildings." Visually compatible architectural designs for new structures which will be located near significant historic buildings is another example. The effectiveness of this measure will depend on the nature and scope of the proposal. For example, replacement of deteriorated parts with parts made of the same materials, duplicating form, shape, color and texture of the original can be very effective. Generally, smaller scale projects can be more effectively treated than larger scale projects (e.g. - new window installation vs. new building construction).

4. Relocation or data recovery which is normally undertaken only when avoidance or special protective techniques are not practicable: examples are the removal of a significant structure or object for continuing use or display elsewhere, photo-documentation, and measured drawings and mapping of a structure or object prior to dismantling. Such work would be accomplished according to the standards of the Historic American Buildings Survey, or the Historic American Engineering Record. Partial or full excavation of an archeological site to recover the significant data it contains, executed in keeping with the Advisory Council on Historic Preservation's "Treatment of Archeological Properties: A Handbook," is also a possibility. This measure is very effective in recording the data the site contains or storing that data elsewhere. But by its very nature it is not at all effective in preserving the site in-place, and is therefore used only when other measures are not practicable.

There are no absolute standards that establish what level and kind of project mitigation would be necessary. Each cultural resource is unique, and therefore appropriate mitigation measures will usually be developed on a case-by-case basis as part of specific cultural resource compliance procedures that apply to the project. Programmatic compliance procedures, such as the Programmatic Memorandum of Agreement between the Forest Service, State Historic Preservation Officer, and Advisory Council on Historic Preservation for Depression Era Forest Service Administrative Structures, will be used when these programs apply.

i. Effects of Alternatives' Activities on Energy Resources

Table IV-16, Energy Balances by Resource Group and Planning Alternative, discloses the estimated impacts of

Table IV-16

Energy Balances by Resource Group and Alternative

	NC		A		B		C		D	
Resource Group	Consume	Yield	Consume	Yield	Consume	Yield	Consume	Yield	Consume	Yield
Timber	290.5	137.5	290.5	137.5	325.9	154.3	357.2	169.1	272.9	129.2
Biomass	13.7	819.1	13.7	819.1	15.8	942.6	14.4	862.9	14.3	854.1
Range	0.3	0.1	0.3	0.1	0.3	0.1	0.3	0.1	0.3	0.1
Recreation	98.1	0.4	98.1	0.4	97.5	0.4	97.5	0.4	96.3	0.4
Water	22.6	377.2	22.6	377.2	22.6	377.2	22.6	377.2	22.6	377.2
Minerals ^{1/}										
(Fuels)										
Minerals ^{1/}										
(nonfuels)	2.2	0	2.2	0	2.4	0	2.4	0	2.5	0
Roads	4.3	0	4.3	0	4.5	0	4.6	0	4.2	0
Fire Mgmt	19.3	0	19.3	0	18.5	0	20.1	0	15.5	0
Totals	451.0	1334.3	451.0	1334.3	487.5	1474.6	519.1	1409.7	428.6	1361.0
Net Energy Balance (Yield Minus Consumption)	+883.3		+883.3		+987.1		+840.6		+932.4	

	E		F		G		H		I	
Resource Group	Consume	Yield	Consume	Yield	Consume	Yield	Consume	Yield	Consume	Yield
Timber	261.3	123.7	207.9	98.4	245.7	116.3	96.7	45.8	174.6	82.6
Biomass	13.3	797.2	10.6	630.7	13.3	797.2	6.7	398.6	9.5	569.4
Range	0.2	0.1	0.2	0.1	0.2	0.1	0.1	0.1	0.2	0.1
Recreation	96.9	0.4	96.3	0.4	96.9	0.4	96.3	0.4	91.6	0.3
Water	22.6	377.2	22.6	377.2	22.6	377.2	22.6	377.2	22.6	377.2
Minerals ^{1/}										
(Fuels)										
Minerals ^{1/}										
(nonfuels)	1.6	0	1.0	0	1.5	0	0.8	0	1.2	0
Roads	4.1	0	3.8	0	4.3	0	3.6	0	3.7	0
Fire Mgmt	14.1	0	10.0	0	11.4	0	6.5	0	10.5	0
Totals	414.1	1298.6	352.4	1106.8	395.9	1291.2	233.3	822.1	313.9	1029.6
Net Energy Balance (Yield Minus Consumption)	+884.5		+754.4		+895.3		+588.8		+715.7	

^{1/} Energy balance for fuel mineral production is predicted on "proven" deposits. There are no "proven" mineral fuel deposits (economically extractable) presently known to occur on the Mt Hood National Forest. projected future production is speculative and is dependent upon future energy demand, industry interest, and exploration results. Therefore, energy computations for this resource group have not been made.

the various alternatives on the Forest's sources and requirements of energy.

The energy consumption component includes the energy needed to produce and utilize Forest resources and to provide services and protection from natural disasters. The energy yield component includes direct fuel values, hydroelectric power savings, savings over substitute materials, and savings due to a reduced need for energy expenditures.

The net energy balance is the difference between the energy produced and expended in the uses of Forest resources or services.

3. Short Term Uses And Long Term Productivity

Introduction

Maintenance of long term productivity is a basic management goal of all National Forests. The policy of maintaining long term sustained yield capacity in timber is an example of managing to meet that goal. Short term uses are incorporated in annual production targets such as annual timber harvests and other commodity outputs. The differences between these two objectives is best shown in the Multiple Use Sustained Yield Act which defines sustained yield as the "achievement and maintenance in perpetuity of high annual or periodic output of the various renewable resources of the national forests without impairment of the productivity of the land." The Forest is therefore expected to produce a variety of goods and services, short term uses, but it is directed to accomplish this without reducing long term productivity. The discussions which follow track the problems created by this

dual function with respect to timber production and soil productivity.

a. Timber Production

The question of long term timber productivity is an issue in timber management because some alternatives call for departure from the base harvest schedule in order to produce short term increases in timber harvests.

As many as 90 years may be required before a harvested area can be reharvested. Therefore, in the context of this discussion short term uses are those up to 10 years in duration. In this context, long term productivity refers to the Forest's capacity to produce chargeable harvests on a nondeclining, even-flow schedule from the 60th year of the plan into perpetuity. The period between the 10th and 60th year represents the transition between short term uses and long term productivity.

Analysis of up to 90 harvest scenarios (land bases, harvest constraints, and other factors) discloses that four key variables are basic components of short term uses and long term productivity:

1. Land base acres allocated to Management Area C1, Timber Emphasis.
2. Standing inventory: Existing volume per acre in the land base.
3. Dispersion: Imposing a maximum size limit for openings in the forest and a minimum distance between openings.
4. Departure: Policy of allowing varying harvests per decade.

As shown in Table IV-17, Alternatives B, C, and D demonstrate that the ability to maximize short term har-

Table IV-17
Short Term Effects Of Departure Alternatives

KEY HARVEST VALUES	DEPARTURE ALTERNATIVES		
	C	B	D
First Decade Chargeable Harvest(MMCF)	793.6	660.6	565.7
Land base (Management Area C1 acres)	516,000	476,500	369,000
Standing Inventory (MMCF)	3,549	3,170	2,869
Harvest Divided by Total Acres	1.5 MCF/Acre	1.4 MCF/Acre	1.3 MCF/Acre
Harvest Divided by Total Inventory	0.2 CF/CF	0.2 CF/CF	0.2 CF/CF

vest volumes through departures is essentially a function of land base, or, if volume per acre is essentially constant, inventory.

Table IV-18 addresses the short term increases under these alternatives in relation to their respective acre-

purpose of these regulations is twofold. On the one hand, monitoring is needed to make sure that goals and objectives of the Forest Plan are actually being met. On the other hand, monitoring is needed to make sure that long term productivity is being maintained.

Table IV-18
Short Term Versus Long Term Harvest

	DEPARTURE ALTERNATIVES		
	C	B	D
Increase in First Decade Harvest Over LRSY Long Run Sustained Yield (MMCF per decade)	+40.2% 565.9	+28.4% 514.3	+24.2% 455.6

bases and long term sustained yield capacity.

These two tables demonstrate that the ability to depart from long term sustained yield capacity in order to increase short term harvest varies with the land base. That is, an increase in the land base can increase the amount of short term harvest gain that can be achieved without affecting long term productivity. This effect would continue until the managed land base would be reduced to about half of the original 647,000 tentatively suitable acres. As this point would be reached, the amount to be gained through departure would diminish to less than 10% of long term sustained yield capacity, and the dispersion constant would become increasingly important.

None of the alternatives propose short term uses which would cause unmitigated environmental effects curtailing the long term productivity of the Forest. In other words, each alternative preserves the Forest's ability to produce all of the alternatives' outputs (habitat, recreation, timber, and others) for 150 years and beyond.

The interdisciplinary team developed management standards and guidelines for two basic purposes. One was to insure or protect long term productivity. The second was to establish a working balance and integrate resource uses and activities. The ultimate intent is that long term productivity and the values of all resources be maintained at predetermined, acceptable levels. Therefore, specific direction and mitigation requirements of the Forest's management standards and guidelines are largely aimed toward maintaining long term productivity. Further information about management standards and guidelines for the proposed Forest Plan are available in Appendix D, DEIS, Management Direction.

NFMA planning regulations require the Forest Plan to specify monitoring and evaluation requirements. The

The departure alternatives, B, C, D, and E, require more monitoring to assure long term productivity than is required by alternatives which specify non-declining harvests. Monitoring requirements are fully described in the proposed Forest Plan.

b. Soil Productivity

Maintaining long term soil productivity has been identified as a management concern related to short term uses, such as timber harvest and fuel treatment activities that use track or wheel-mounted equipment. Productivity losses resulting from surface soil compaction produced by ground skidding and machine piling activities are primary concerns.

Research has demonstrated measurable losses in site quality in areas where the soil surface has been compacted by ground equipment. Surface soil layers in skid trail systems typically exhibit reduced macropore space and infiltration capacities, and increased bulk densities. Seedlings growing in compacted soils show lower growth rates in comparison to plants occupying undisturbed sites. Growth losses resulting from soil compaction are most noticeable in the seedling and sapling stages. This research also indicates that growth rates are not significantly reduced in pole-sized timber.

All soils are subject to compaction. The extent of compaction depends on clay content, rock content, organic matter content, structure, and soil moisture. Soil moisture is an important factor in the compaction process because it is an independent factor in determining soil strength. Soils developing in pyroclastic rock material exhibit the highest compaction hazard on the Forest. In general, soils with a moderate surface texture are believed to possess a moderate compaction hazard.

Although guidelines emphasize that compaction on harvest sites be limited to no more than 15% of the harvest area, this goal often is not met because both tractor harvest and machine piling are utilized sequentially. The impact of compaction from the combined activities is increased in part due to an inability to restrict machine piling to areas with favorable levels of soil moisture.

The effects of compaction are known to last at least 40 years. The longevity of effects has implications for soil productivity when multiple entries are planned for the subsequent rotation. With each thinning entry, soils will be newly damaged and production from the standing crop will be diminished.

4. Irreversible and Irretrievable Commitments of Resources

a. Irreversible Commitments

Alternative E, the preferred alternative previously described in this Statement, was formulated with the understanding that maintenance of future commitments of resources refers to the use of nonrenewable resources like minerals. Future commitments would also apply to resources which are renewable only over a long period of time, such as soil productivity.

Measures to protect resources where potentially irreversible impacts could occur were incorporated into Minimum Management Requirements specified by the Region. These protective measures were also incorporated into standards and guidelines developed by the Forest.

(1) Minerals

Development of mineral resources is an irreversible commitment because the minerals would be unavailable for future uses once they have been extracted. Gravel and rock (known as common variety minerals) used in road construction would be included in this category because this resource must be available near its place of use to be cost-effective.

Most common variety minerals produced on the Forest are rock materials for on-Forest road building, road reconstruction, and maintenance. Road construction and reconstruction depend primarily on the mileage of road needed to harvest timber at a particular level.

The rock resource available in existing quarries is sufficient to meet future demands for road maintenance on existing Forest roads, also special uses by other Federal, county, and local agencies, and private concerns. Road construction and reconstruction requirements estimated in the preferred alternative will exceed the available supply in varying degrees. Projections in this alternative indicate that one or more of the following drainages will

have rock resource shortages within a maximum of four decades:

1. Lower Clackamas
2. Oak Grove Fork
3. Hot Springs Fork
4. Collawash
5. Upper Clackamas

Once a quarry is exhausted, it is an irreversible loss of a resource. Any time rock resources are mined and used, it is an irreversible commitment of a resource.

(2) Cultural Resources

Timber harvest, facility construction, and vandalism may destroy irreplaceable archeological and historical sites. These sites can be damaged by project activities that disturb previously unidentified sites. They can also be impaired by requiring the removal of cultural resources in conflict with project activities. The common mitigation method used before a site is removed is to undertake a data recovery or documentation program of the site. These programs can only recover part, not all, of the significant values contained by the site. Much of the important aspects of cultural resources lies in their continued existence for future generations to study and enjoy as part of their cultural heritage. Once a site is removed or irreparably disturbed, these values are permanently lost.

(3) Unroaded Areas

Allocations of unroaded areas to roads and timber harvest permanently remove the land from consideration for Wilderness and primitive types of recreation for the foreseeable future.

b. Irretrievable Commitments

Irretrievable commitment of natural resources is defined as the production or use of renewable resources lost due to their allocation for a specified purpose. The allocation essentially eliminates alternative production or uses for the period of time the resource has been committed. If the allocation were to be changed, the resource could again be usable. The production lost is irretrievable, but the action itself is not irreversible. This type of commitment would include:

- (1) **Long rotations:** Allocations of productive timber lands to long rotations will reduce potential wood fiber production.
- (2) **Facilities construction:** Road construction and developed site construction represent long term removal of land from production of various resources.
- (3) **Range:** Grazing resources on the Forest are transitory and depend on timber harvest for their viability.

The preferred alternative's level of harvest would cause a partial loss of grazing areas.

5. Probable Adverse Environmental Impacts That Cannot be Avoided

Introduction

Implementation of Alternative E, the preferred, will produce adverse impacts which cannot be avoided. The process of formulating the alternatives weighed a wide range of activities including some that would have major adverse effects on the environment. Many of these effects could be avoided or limited by applying management direction. Management direction (for details see Appendix D, Management Direction) provides for the production of Forest goods and services within the constraint of maintaining sustained yields of recreation, timber, water, wildlife, and forage without impairment of long term productivity.

a. Potential Adverse Impacts on Forest Resources

Although long-term productivity would be maintained by the preferred alternative, and every effort would be made to mitigate adverse impacts, some are inevitable. They include:

- (1) **Transportation:** Constructing and reconstructing roads will affect aesthetics, aquatic habitat, wildlife, noise levels, and the number of people who use an area.
- (2) **Wildlife:** Increased human activities in project areas could temporarily harass or displace wildlife.
- (3) **Air Quality:** Prescribed burning will temporarily change air quality. These changes would be in the form of increased smoke locally and as a component of regional haze.
- (4) **Water Quality:** Activity-caused sediment is considered the greatest polluting material in Forest streams. Project activities such as timber harvest may contribute sediment to adjacent streams due to inadequate road drainage, scarification, skid trails and landslides. Recreational activities may adversely affect aquatic habitat through overfishing and trampling of stream and lakeside areas.
- (5) **Cultural Resources:** Prehistoric or historical evidence of early human activities on the Forest could be disturbed by management activities. Field surveys would be conducted prior to all ground-disturbing projects. However, the dense vegetation in many parts of the Forest may prevent the discovery of some cultural sites not yet identified.
- (6) **Scenic Values:** Timber harvest and road building often change the landscape in ways observers do not

like. Some changes are temporary; some last a long time. Debris on the ground, overstory removal, understory vegetation disturbance, dust, and noise are normally produced by these activities. They are also relatively short term effects.

(7) **Fire Management:** Fire hazards temporarily increase during the short term period of logging and thinning operations due to waste materials left on the ground in the form of unmerchantable trees, tops, limbs, and needles.

(8) **Recreation:** Project activities like timber harvest and road building temporarily disrupt recreation opportunities by reducing or changing the type of recreation use previously available in the area.

(9) **Community Values:** Some communities adjacent to the Forest will experience a decrease in employment related to wood products produced on the Forest. Counties within the Forest boundaries would receive lower payments in lieu of taxes under the provisions of the preferred alternative.

6. Environmental Conditions Which Do Not Change by Alternative

Although many types of management activities remain unchanged throughout the planning horizon, their intensities change. Timber management would continue to be harvested at a level of at least 107 MMBF per year. Logs would continue to flow to mills in the area of influence. All alternatives would produce an even flow of timber at long run sustained yield capacity beginning in the sixth decade.

With respect to forest products, i.e. timber harvest levels, all alternatives incorporate a nondeclining yield over the long run. A temporary departure in harvest levels is built into Alternatives B, C, D, and E. But the harvest levels associated with these departures are limited to 25% from decade one to decade five. Harvests reach equilibrium after decade five, and harvests then remain at long run sustained yield capacity. In three other alternatives, H, I, and F, harvest levels start well below long run sustained yield capacity, but they also reach equilibrium by the fifth decade.

No final timber harvest occurs before 95% of culmination of mean annual increment has been reached. This means that stands must reach 95% of their maximum rate of wood production before final harvest could take place. Constraints on the size of openings created by timber harvest and the distances between those openings would remain in effect.

Chargeable timber harvests would not be permitted on lands unsuitable for timber production, i.e. lands which cannot support a sustained yield of timber would be har-

vested only on a salvage basis for the purpose of removing dead and dying trees.

The Forest would continue to provide a broad range of recreational activities reaching a total of more than six million RVDs per year. Although the proportions of developed and dispersed uses would vary by alternative, all currently available recreation activities would continue to be available on the Forest.

The Forest would provide a minimum of 188,000 acres of Wilderness recreation no matter which alternative is implemented. Water resources would continue to be available for fish habitat, irrigation, and domestic uses. The Dalles, Portland, and Dufur would continue to receive high-quality water from their respective watersheds.

Wildlife habitat for deer and elk will continue to be available, including adequate thermal cover in winter range areas. Snags will be provided at a level to maintain at least 60% of biologic potential for cavity dependent species. Special habitats such as wetlands, caves, and talus slopes will be maintained. Species viability will be maintained for at least 51 pair of spotted owls, as well as pine marten, pileated woodpecker, silver-grey squirrel, and turkey.

Various special uses will continue on the Forest, including recreation sites, agricultural uses, utility and transportation corridors, private water systems, and the like. Mineral exploration and development will continue, including leases for oil, gas, and geothermal resources.

Designated Research Natural Areas (RNA's) and Special Interest Areas (SIA's) will continue under current management.

LIST OF PREPARERS

Name: **Clint Bird**
Position: Timber Planner
Education: B.S. Forest Management
Experience: Fifteen years on Districts working in various timber management positions. Five years Supervisor's Office in timber plans. Interdisciplinary Team Member from inception of Forest Plan on Mt. Hood: provided timber input for the planning process.

Name: **Myron Blank**
Position: Assistant Planning Staff, Interdisciplinary Team Leader
Education: B.S. Forestry, M.S. Environmental Planning
Experience: Thirteen years as project and area planning coordinator. NEPA advisor on Mt. Hood National Forest. As Interdisciplinary Team Leader: developed work plans, schedules, and provided overall coordination between Ranger Districts, Supervisor's Office and Regional Office.

Name: **Donald Carlton**
Position: Forest Fuels Specialist
Education: B.A. Math, M.S. Math, M.S. Forestry
Experience: Five years teaching Math, at high school level. Six years full time forestry (one year in fire suppression, two in fire prevention, and three in fuels management). Three years part-time forestry (fire prevention and suppression). Interdisciplinary Team member: had major responsibility in integration of air quality, fuels and fire management into the Forest Plan and preparation of the fire plan for the preferred alternative.

Name: **Ted Cobo**
Position: Program Analyst
Education: B.S. Forestry
Div. Religious Education
Experience: Nine years Forester on Ranger Districts. Five years recreation planning in Supervisor's Office. Five years Land Management Planning Core Team member, Rouge River N.F. Two years Program Analyst in Supervisor's Office. Four years Group Ministry Staff member. Contributed to preparation of the Monitoring Plan: consulted with Land Management Planning Team members about description of the Forest program in budget terms.

Name: **Douglas K. Daoust**
Position: Forest Silviculturist
Education: B.S. Forest Management, Certified Silviculturist in Region 6
Experience: Three years in fire, presale, and silviculture - Siskiyou N.F. Seven years as District Silviculturist - Olympic N.F. Four years as Forest Silviculturist - Mt. Hood N.F. One year intensive training - Silviculture Institute (OSU, UW). Certified silviculturist since 1980. Interdisciplinary Team Member: developed per acre yield tables, conducted suitability acres study and provided silvicultural activities input.

Name: **Dora Decoursey**
Position: Geographer
Education: B.A. Environmental Studies, M.S. Geography, in progress
Experience: Planning Aide, San Joaquin County, CA; Cartographic Research Intern, National Geographic Society. Three years on Land Management Planning Team and in Timber Management on Mt. Hood: managed computerized mapping systems for planning and inventory purposes. Utilized geographic data base to provide information for resource and alternative analysis. Coordinated production of maps accompanying document.

Name: **Cecil Dewing**
Position: Recreation Planner
Education: B.S. Forest Management
Experience: Twenty years Forest Service timber sale planning and layout Reforestation, Sale Administration, Other Resources Assistant, Job Corps District Ranger. Interdisciplinary Team member: had involvement in Forest Planning Process from day one of Forest Planning under NFMA.

Name: **Clinton Eckstein**
Position: Assistant Staff Recreation and Lands.
Education: B.S. Forest Management
Experience: Seven years as Forester in recreation and timber on District. Fifteen years in recreation and lands in Supervisor's Office. Interdisciplinary Team Member: provided special uses and land ownership information for the planning process.

Name: **Jan M. Engert**
Position: Public Affairs Specialist
Education: B.S. Forest Management
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Name: **Richard Fairbanks**
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Name: **William A. Geurds**
Position: Land Management Planning Staff Officer
Education: B.S., M.S. Civil Engineering
Experience: Eight years urban planning, private consultant. Three years interdisciplinary team leadership, Forest Service. Two years District Ranger, Estes Park District, Arapaho-Roosevelt N.F. Two years Assistant District Ranger, Dillon District, White River National Forest. Two years Program Analyst, Rocky Mountain Regional Office, Forest Service. Two years Management Analyst, Washington Office. Planning Staff Officer on the Mt. Hood National Forest since 1980.

Name: **Jonathan Haber**
Position: Economist, analyst
Education: B.S. Resource Conservation, M.S. Regional Natural Resource Planning, Two years completed towards law degree
Experience: One year in timber, hydrology and recreation inventory on Beaverhead National Forest, three years as planning analyst on the Helena National Forest. Three years on Land Management Planning Team: responsible for use of timber yield, cost and price information in the analysis, use of data in the analysis of Alternatives, and for the overall sufficiency of the analysis.

Name: **Anne Heisler**
Position: Director, Office of Information
Education: B.S. Forest Management
Experience: Eighteen years with Mt. Hood National Forest: at Columbia Gorge District, sale layout; Supervisor's Office, Recreation; Supervisor's Office, Information and Education (now office of Information). Worked off and on full time with Land Management Planning Team on Forest Unit Plans, since 1971: responsibilities included public involvement, resource input, writing, editing, publication layout and design, NEPA coordinating, public input analysis, RARE II. Development of public involvement plan, initial work plan, issues/concerns/opportunities, decision criteria, wilderness prescriptions and achievements. Also involved in developing processes for I.D. Team and Management Team decision making.

Name: **Dave Heller**
Position: Forest Fisheries Habitat Biologist
Education: B.S. Zoology, M.S. Aquatic Biology
Experience: Four and one half years U.S. Navy Submarine Service. One year Aquatic Ecologist Consultant, Perrin Partnership, Portland, OR. One year stream survey while on Land Management Planning Team, Willamette N.F. Six and one half years District Fish Biologist, Siuslaw N.F. One and one half years Forest Fish Habitat Biologist, Mt. Hood N.F. Certified Professional Fisheries Biologist, American Fisheries Society (1978). Interdisciplinary Team Member: provided input regarding Fish habitat capability and management and riparian area inventory, classification, and management. Coordinated planning with various agencies and groups with interest in fish habitat management.

Name: **Harold P. Lange**
Position: Energy Coordinator
Education: B.S. Forest Management
Experience: Five years as Forester on a District. Seven years Job Corps as Administrative Officer and Assistant Center Director. Eight years District Ranger. Interdisciplinary Team member: provided minerals and energy program input.

Name: **Dean P. Longrie**
Position: Forest Wildlife Biologist
Education: B.S. Botany, M.S., Ph.D. Wildlife Ecology
Experience: Three years environmental analysis and impact statement preparation consultant. One year Wildlife Biologist for Federal Energy Regulatory Commission. Two years Assistant Professor of Wildlife, University of Wisconsin. One year Wildlife Biologist, BLM, Oregon State Office. Three years Forest Wildlife Biologist, Mt. Hood National Forest. Interdisciplinary Team Member: provided input on wildlife, sensitive species (plant and animal), special habitats (wetlands, riparian) part of I.D. Team that organized preferred alternative.

Name: **Dan E. Magallanez**
Position: Civil Engineer
Education: BS, Civil Engineering
Experience: Four years, Umpqua N.F., Engineering Trainee, Construction, Transportation System Management, Preconstruction. Three and one half years, Mt. Hood N.F., Forest Transportation Planner, Road Management, Road Maintenance, Traffic Engineering, Geometronics, Data Base Management. Interdisciplinary Team Member: provided all engineering input, coordination, evaluation and analysis.

Name: **Susan H. Marvin**
Position: Forest Archeologist
Education: B.A., M.S. Anthropology
Experience: Eight years as an Archeologist, the last three specializing in cultural resource management as a Forest Archeologist. Interdisciplinary Team Member: provided cultural resource management and AIRFA information for the planning process. Provided cultural resource inventory information for Analysis of Management situation. Developed standards for cultural resources program.

Name: **Michael B. McArthur**
Position: Soil Scientist
Education: B.S. Wildlife Biology, M.S. Range Management.
Experience: Five years experience in soil science as soil surveyor for State of Washington. Three years as soil scientist in Mt. Hood N.F. Supervisor's Office. Interdisciplinary Team Member: involved in Forest Planning Process in development of sediment coefficients used in Forest Plan model. Involved in writing manuscript for land suitability and presenting information on the Forest unsuitable land base to District and Regional Office personnel.

Name: **Maureen McBrien**
Position: Planning Geologist
Education: B.A. Geology, M.A.L.S Earth Science
Experience: Seven years educator, high school level earth science and geology. Six years as Forest Service Geologist. Interdisciplinary Team member; worked on development of land suitability, provided geologic and minerals input to the Forest Planning process.

Name: **Jack Parcell**
Position: Forest Soil Scientist
Education: B.S. Soils and Agronomy
Experience: Eleven years Soil Scientist, Soil Conservation Service. Eleven years Soil Scientist, Forest Service. Interdisciplinary Team Member: provided base soil map, worked with development of land suitability.

Name: **Elvia Ruiz**
Position: Forestry Technician
Education: Computer Programs Training, Civil Rights Training, State Certified Radiologist
Experience: Four years Total Resource Data Base Manager, Ten years Total Resource Information Coordinator/Instructor. Member Land Management Planning Team: provides Resource Data for Forest Planning effort.

Name: **Richard S. Shaffer**
Position: Forest Landscape Architect
Education: B.S. Landscape Architecture.
M.U.P. Urban Planning/Land Use and Environment.
Experience: Four years as landscape architect and planner, Oregon State Parks and Recreation Division. Twenty years as Forest Landscape Architect, Mt. Hood National Forest. Interdisciplinary Team Member: provided data and analysis for the visual resources component of the Forest Plan and interim management direction for candidate Wild and Scenic Rivers.

Name: **Maurice C. Sholl**
Position: Range Conservationist
Education: B.S. Forestry (Wildlife Option).
Experience: Six and one half years (1951-1957) Ohio Division of Wildlife, Wildlife Management Agent. 24-1/2 years (1958 to present) Forest Service in Range and Wildlife capacities, ten years on District, five and one half years Mt. Hood Supervisors Office, nine years in special assignment on East Side of Mt. Hood (attached to S.O.). Interdisciplinary Team Member: provided range information for planning process.

Name: **Jack L. Stiverson**
Position: Lead Writer/Editor
Education: B.S. Forest Management, B.S. Wildlife Science
Experience: Six years U.S. Navy, electronics. Four years Tektronix Inc, electronics Technician. Five seasons experience in outdoor recreation while attending college. Fourteen years on Districts (BLM & Forest Service) in various Forestry positions including interpretation, reforestation, tree planting inspection, timber sale layout, survey work, timber inventory, timber planning, outdoor recreation, trail planning, construction and maintenance, and human resource programs. Over seven years of this time was in position of District Silviculturist or RDMA position of Other Resources Assistant. Three and one half years Supervisors Office on Land Management Planning Team: serving as Lead Writer/Editor for Forest Planning effort, assisted with coordination of I.D. Team work, responsible for work force planning and development of management direction for Forest Plan.

Name: **Jeffery M. Stone**
Position: Economist/Analyst
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Experience: Eleven years non-Forest Service (survey, engineering, systems analysis). Five years Sierra National Forest (economist/analyst) Three years Mt. Hood National Forest Land Management Planning Team: served as economist/analyst. Shared responsibility for FORPLAN and economic analysis. Facilitated the estimation of outputs and effects shown in Chapter II, DEIS.

Name: **Richard H. Wheeler**
Position: Hydrologist
Education: B.S. Forest Management, M.F. Forest Hydrology/Watershed Management
Experience: Four years U.S. Air Force, March Air Force Base. Two years Forester, Timber Management, Savannah River Project. Three years, Assistant Ranger, Choctaw RD, Ouachita N.F. Two years. Forester, Watershed Management, Roosevelt N.F. Two years Forester, Watershed Management Arapaho N.F. Six years Regional Hydrologist, Regional Office, Region 1. Three years Forestry Officer, Mae Sa Project, Chiang Mai, Thailand. Two years Hydrologist, Regional Office, Region 1. Eight and one half years Hydrologist, Mt. Hood National Forest. Interdisciplinary Team Member: provided expertise on water yield and quality, including riparian management and aquatic habitat, as they affect Forest and project planning. Also had responsibilities outside the Forest Plan for the hydrology portion of the Forest's watershed management program as well as providing technical assistance, advice and counsel to District Rangers and certain of their staffs in support of Ranger District activities, especially timber sale planning. Retired from Forest Service 1986. Currently: Forester and Hydrologist Oregon Environmental Team, for Steffen, Robertson, and Kirsten, Inc. (Denver) and Quartz Gold Corporation, Vancouver BC, Canada.

List Of Contributors

Development of the Forest Plan and DEIS required the support and assistance of the entire National Forest staff over an eight year period.

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Gretchen Starke	Writer/Editor
Karen Williams	Typist
Shelly York	Typist

List of Agencies, Organizations, and Persons to Whom Copies of the Statement are Sent

Copies of the Draft Environmental Impact Statement (DEIS) and proposed Forest Plan were distributed to the following individuals, organizations, and Government agencies. Those individuals specifically requesting copies of the DEIS and Forest Plan were mailed a copy.

Copies of the DEIS and Forest Plan are available for review at the following locations:

Forest Supervisor's Office
2955 N.W. Division
Gresham, OR 97030
Phone: (503) 666-0700

Columbia Gorge Ranger District
31520 S.E. Woodard Road
Troutdale, OR 97060
Phone: (503) 695-2276

Barlow Ranger District
P.O. Box 67
Dufur, OR 97021
Phone: (503) 467-2291

Estacada Ranger District
595 N.W. Industrial Way
Estacada, OR 97023
Phone: (503) 630-6861

Bear Springs Ranger District
Rt. 1, Box 222
Maupin, OR 97037
Phone: (503) 328-6211

Hood River Ranger District
6780 Highway 35
Mt. Hood - Parkdale, OR 97041
Phone: (503) 666-0701

Clackamas Ranger District
61431 E. Highway 224
Estacada, OR 97023
Phone: (503) 630-4256

Zigzag Ranger District
70220 E. Highway 26
Zigzag, OR 97049
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MAILING LIST

FEDERAL AGENCIES

Advisory Council on Historic Preservation

Office of Architectural and Environmental Preservation

Agriculture, U.S. Department of

Animal and Plant Health Inspection Service

Forest Service

- Columbia Gorge National Scenic Area
- All Regional Offices
- Region 6-All Forests
- Pacific Northwest Forest and Range Experiment Station

- Rocky Mountain Forest and Range Experiment Station
- WESTFORNET - North
- WESTFORNET - South
- Office of Equal Opportunity
- Rural Electrification Administration
- Soil Conservation Service
- Commerce, U.S. Department of,**
 - National Marine Fisheries Service
 - NOAA, Ecology and Conservation Division
- Defense, U.S. Department of**
 - Air Force
 - Army Corps of Engineers
 - Deputy Assistant Secretary
 - Explosives Safety Board
 - Navy
 - U.S. Naval Observatory
- Delaware River Basins Commission**
- Energy, U.S. Department of**
 - Bonneville Power Administration
 - Office of Environmental Compliance
- Environmental Protection Agency**
 - Office of Federal Activities
 - Region X, EIS Review Coordinator
- Federal Energy Regulatory Commission**
- General Services Administration**
- Health and Human Services, U.S. Department of**
- Interior, U.S. Department of**
 - Bureau of Indian Affairs
 - Bureau of Land Management
 - Bureau of Mines
 - Bureau of Wildlife Service
 - Bureau of Park Service
- Interstate Commerce Commission**
- Labor, U.S. Department of**
 - Assistant of Mine Safety and Health
 - Assistant Secretary for Occupational Safety and Health
- National Endowment for the Arts**
- Transportation, U.S. Department of**
 - Assistant Secretary for Policy and International Affairs
 - Federal Aviation Administration
 - Federal Highway Administration

U.S. Coast Guard

REGIONAL AGENCIES

Northwest Power Planning Council

Washington and Oregon Gorge Commissions

STATE AGENCIES

State of Oregon

Department of Energy

Department of Environmental Quality

Department of Fish and Wildlife

Department of Forestry

Department of Revenue

Intergovernmental Relations Division

Joint Legislative Committee

Senate Majority Office

Trade and Economic Development

NATIVE AMERICANS

Confederated Tribes of Warm Springs Reservation

ELECTED OFFICIALS

Oregon

Commissioner Mike Lindberg

State Representative Dave McTeague

State Senator Jim Simmons

U.S. Representative Les AuCoin

U.S. Representative Peter Defazio

U.S. Representative Denny Smith

U.S. Representative Robert Smith

U.S. Representative Ron Wyden

U.S. Senator Mark Hatfield

U.S. Senator Robert Packwood

Washington

U.S. Representative Don Bonker

U.S. Representative Sid Morrison

U.S. Senator Brock Adams

U.S. Senator Dan Evans

COUNTY

Clackamas County Board of Commissioners

Hood River County Board of Commissioners

Jefferson County Board of Commissioners

Marion County Board of Commissioners

Multnomah County Board of Commissioners

Wasco County Board of Commissioners

Clackamas County Department of Transportation and Dev

East Multnomah SWCD

Hood River County Planning Department

Jefferson County Planning Department

Marion County Planning Division

Multnomah County Planning Department

Wasco County Planning Department

Washington County ESO

CITY

Portland Water Bureau

The Dalles Department of Water Supply

Troutdale

NEWSPAPERS

Business Journal

Chronicle

Clackamas County News

Enterprise Courier

Gresham Outlook

Hillsboro Argus

Hood River News

Jefferson Review

Keizertimes

Molalla Pioneer

Portland Business Today

Register-Guard

Sandy Post

The Mountain

The Oregonian

The Villager

Tigard/Tualatin Times

West Linn Tidings

Woodburn Independent

USA Today

LIBRARIES

Clackamas Community College

Multnomah County Library

ORGANIZATIONS

American Fisheries Society

American Forest Institute

American Rivers

AOA

Argonne National Laboratory
Associated Oregon Loggers
CHEC
City Club of Portland
Columbia Group Sierra Club
CRITFC
Eastern Oregon Health Systems Agency
Environmental Defense Fund
Land, Air and Water
League of Conservation Voters
Log Truckers Conference
Mazama Conservation Committee
Mt. Hood Recreation Association
Mt. Hood Snowmobile Club
Mt. States Legal Foundation
National Audubon Society
National Forest Prod. Association
National Wildlife Federation
National Resources Defense Council
Nature Conservancy
Northwest Forestry Association
Oregon Council of Rocks and Minerals
Oregon State Snowmobile Assoc. Inc.
OR-Calif. Trails Association
Oregon Environmental Council
Oregon Motorcycle DLRs Assn.
Oregon Natural Res. Council
Oregon Nature Institute
Oregon Rivers Association
Oregon SAF
Oregon Trout
Portland Audubon Society
Sierra Club Legal Def. Fund
Sierra Club, NW Office
The Trust for Public Land
Trails Club of Oregon
Trout Unlimited
Virginia 4-Wheel Drive Association
Wilderness Society
Wildlife Management Institute

BUSINESSES

Avison Lumber Company
Bald Knob Land and Timber Company
Bugaboo Timber Company
Crown Zellerback Corporation
Frank Lumber Co., Inc.
Freightliner Corporation
Georgia Pacific Corporation
Keller Environmental Association
Manville Sales Corporation
Mason, Bruce and Girard
Merrill Lynch World Headquarters
Mt. Fir Lumber Co., Inc.
Mt. Hood Meadows Dev. Co.
Musselmen Assoc., Inc.
Pacific Marine Technology
Pacific Power
Portland General Electric
Prineville Sawmill Co.
Saltman and Stevens
Soloman Brothers, Inc.
Stevenson Co-Ply
Times Mirror Land and Timber Co.
Toms Landscaping
Vanport Mfg., Inc.
Weyerhaeuser Co.

EDUCATION

Duke University
Estacada Board of Education
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Fresno City College
Oregon State University
University of California
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The names of individuals who are on our mailing list is available for review at the Mt. Hood National Forest Supervisor's Office.

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GLOSSARY

A

Acre Equivalent

When applied to habitat improvement or improvement structures this term reflects overall habitat benefits derived. It reflects the zone of influence of the habitat improvement for the target species. For example, a single water development for upland game birds occupies very little space but has an acre equivalent of 160 because it serves 160 acres of bird habitat. A single water structure for big game has a value of 640 because it has a larger zone of influence for the more mobile big-game animals.

Acre-Foot

A water measurement term equal to the amount of water that would cover an area of one acre to a depth of one foot (43,560 cubic feet).

Activity

Actions, measures, or treatments that are undertaken that directly or indirectly produce, enhance, or maintain forest outputs and rangeland outputs, or achieve administrative and environmental quality objectives. Forest Service activity definitions, codes, and units of measure are contained in the Management Information Handbook (FSM 1309.11).

Airshed

A geographical area that, because of topography, meteorology, and climate, shares the same air.

Allocated Funds

Funds from sources other than Congressionally appropriated funds. Allocated funds include the Senior Community Service Program (H04), brush disposal (BD), Knutson-Vandenberg cooperative deposits (K-V).

Allowable Sale Quantity (ASQ)

The quantity of timber that may be sold from the area of suitable land covered by the forest plan for a time period specified by the plan. This quantity is usually expressed on an annual basis as the "average annual allowable sale quantity." (36 CFR 219.3). In terms of FORPLAN analysis it is sawtimber (Green), chargeable timber volume only.

Alternative

One of several policies, plans, or projects proposed for decision making.

Analysis Area

The fundamental unit of land required by the Forest Planning Optimization Model (FORPLAN). Delineators include land and location characteristics of importance to the Planning Questions which cause significant differences in quantifiable items (yields, costs, benefits) pertaining to the conditions.

Amenity

An object, feature, quality, or experience that gives pleasure or is pleasing to the mind or senses. Amenity value is typically used in land use planning to describe those resource properties for which market values (or proxy values) are not or cannot be established.

AMS

An abbreviation of Analysis of the Management Situation.

Anadromous Fish

Those species of fish that mature in sea and migrate into streams to spawn. Salmon, steelhead, and shad are examples.

Analysis Area

A delineated area of land subject to analysis of (1) responses to proposed management practices in the production, enhancement, or maintenance of forest and rangeland outputs and environmental quality objectives and (2) economic and social impacts.

Analysis of the Management Situation

A determination of the ability of the planning area to supply goods and services in response to society's demand for those goods and services.

Animal Unit Month (AUM)

The quantity of forage required by one mature cow (1,000 pounds), or the equivalent for one month, based upon average daily forage consumption of 26 pounds of dry matter per day (800 pounds/month).

Annual Sale Quantity

The quantity of timber that may be sold annually from the area of suitable land covered by the Forest Plan.

Appropriate Suppression Response

The planned strategy for suppression action (in terms of Kind, amount, and timing) on a wildfire which most efficiently meets fire management direction under current and expected burning conditions. It may range in objective from prompt control to one of containment or confinement.

Appropriated Funds

Funds from the U. S. Treasury, which Congress has authorized the Forest Service to obligate. This is the sum of operational, capital investment, and backlog costs.

Arterial Roads

See Roads.

Assessment

The Forest and Rangeland Renewable Resource Assessment required by RPA.

AUM'S

An abbreviation of Animal Unit Months.

B

Background

The visible terrain beyond the foreground and mid-ground where individual trees are not visible but are blended into the total fabric of the forest stand (see Foreground and Middleground).

Basal Area

The cross-sectional area of a stand of trees measured at breast height. The area is expressed in square feet.

Base Timber Sale Schedule

A Timber Sale Schedule formulated on the basis that the quantity of timber planned for sale and harvest for any future decade is equal to or greater than the planned sale and harvest for the preceding decade, and this planned sale and harvest for any decade is not greater than long-term sustained yield capacity. (36 CFR 219.3).

Benchmark Levels

The outputs and costs for managing the Forest at certain levels of management so that a comparison could be made on costs, values, and effects.

Benefit

(Value.) Inclusive terms used to quantify the results of a proposed activity, program or project expressed in monetary or nonmonetary terms.

Benefit-Cost Ratio

(Cost efficient.) Measure of economic efficiency computed by dividing total discounted *primary benefits* by total discounted *economic costs*.

Best Management Practices (BMP)

A practice or combination of practices that are the most effective and practical (including technological, economic and institutional considerations) means of preventing or reducing the amount of pollution generated by non-point sources to a level compatible with water quality goals.

Big Game

Those species of large mammals normally managed for sport hunting.

Biological Growth Potential

The average net growth attainable in a fully stocked natural forest stand. (36 CFR 2193)

Biological Potential

The maximum amount of sustainable wood fiber obtainable by application of intensive management (timber) practices to acres classified as commercial forest land. The needs of other forest uses are not incorporated.

Biological Control

A method to control wildlife or insect populations and noxious weeds or tree diseases through the use of applied biology.

Biomass

The total quantity (at a given time) of living organisms of one or more species per unit of space (species biomass), or the total quantity of all the species in a biotic community (community biomass).

British Thermal Unit (BTU)

The amount of heat required to raise the temperature of one pound of water one degree Fahrenheit.

Broadcast Burn

Allowing a prescribed fire to burn over a designated area within well-defined boundaries for a reduction of fuel hazard or as a silvicultural treatment, or both.

Brush

A growth of shrubs or small trees usually of a type undesirable to livestock or timber management.

BTU

An abbreviation of British Thermal Unit.

C

Calibration

The process of predicting modeled fire sizes and fire intensity levels for each Fire Management Analysis Zone. The process uses historical occurrence and burned acreage to accurately reflect the "real world." Adjustments are based on modeling the current fire organization (1978) against historical fire occurrence (1970-1979) using the same dispatch of fire fighting forces philosophy and suppression strategies.

Capability

The potential of an area of land to produce resources, supply goods and services, and allow resource uses under an assumed set of management practices at a given level of management intensity. Capability depends upon current conditions and site conditions such as climate, slope, landform, soils and geology, as well as the application of management practices, such as silviculture or protection from fire, insects, and disease. (36 CFR 219.3)

Categorical Exclusion

A decision to exclude an action from the need to document the environmental analysis in an Environmental Assessment or EIS. It is based on the responsible official finding that the action will have no significant effect on the human environment, individually or cumulatively. If there is any uncertainty regarding effects; appropriate documentation of the analysis is required.

CEQ

Council on Environmental Quality.

Chemical Control

A method to control insect populations or tree disease through the use of applied chemicals.

Chargeable Timber Volume

The timber removed from regulated forest land that contributes to meeting the annual sustained-yield capacity.

Clearcutting

The harvesting in one cut of all trees in an area for the purpose of creating a new, even-aged stand. The area harvested may be a patch, stand, or strip large enough to be mapped or recorded as a separate age class in planning for sustained yield.

Climax

The culminating stage in plant succession for a given site where the vegetation has reached a highly stable condition.

Climax Species

Those species that dominate the forest stand in either numbers per unit area or biomass at climax.

Code of Federal Regulations (CFR)

The listing of various regulations pertaining to management and administration of the National Forest.

Collector Road System

See Roads.

Commercial Forest Land (CFL)

Forest land that is producing or is capable of producing crops of industrial wood and (a) has not been withdrawn from timber management by Congress, the Secretary, or the Chief; (b) existing technology and knowledge is available to ensure timber production without irreversible damage to soils, productivity, or watershed conditions; and (c) existing technology and knowledge, as reflected in current research and experience, provides reasonable assurance that adequate restocking of young trees can be attained within 5 years after final harvest.

Commercial Thinning

Cutting by means of sales of products (poles, posts, pulpwood, etc.) in immature forest stands to improve the quality and growth of the remaining stand.

Commodity

A transportable resource product with commercial value; all resource products which are articles of commerce.

Concern

A point, matter, or question raised by management that must be addressed in the planning process.

Confine

To restrict the fire spread within a predetermined area principally by use of natural or preconstructed barriers or environmental conditions. Suppression action may be minimal and limited to surveillance under appropriate conditions.

Congressionally Classified and Designated Areas

Areas that require Congressional enactment for their establishment, such as National Wilderness Areas, National Wild and Scenic Rivers, and National Recreation Areas.

Conifer

A group of cone-bearing trees, mostly evergreen, such as pine, spruce, fir, etc.

Consumptive Use

Those uses of a resource that reduce its supply.

Contain

To surround a fire, and any spot fires therefrom, with control line, as needed, which can reasonably be expected to check the fire's spread under prevailing and predicted conditions. The normal suppression tactic is indirect attack, allowing the fire to burn to human-made or natural barrier with little or no mop-up.

Control

To complete the control line around a fire and around any spot fires therefrom and any interior islands of vegetation to be saved. Fire fighters will also burn out any unburned area adjacent to the fire side of the control line, and cool down all hot spots that are immediate threats to the control line until the line can reasonably be expected to hold under foreseeable conditions. The normal tactic is direct attack on the fire, if possible, and mop-up to extinguish all fire.

Core Area

(As related to spotted owl.) An area encompassing at least 300 contiguous acres of old growth forest suitable for nesting and reproduction. The area consists of a portion of the territory required by a pair of owls, the nest site, and principal roost areas.

Corridor

A linear strip of land identified for the present or future location of transportation or utility rights-of-way. (36 CFR 219.3)

Cost Efficiency

The usefulness of specified inputs (costs) to produce specified outputs (benefits). In measuring cost efficiency, some outputs, including environmental, economic, or social impacts, are not assigned monetary values but are achieved at specified levels in the least cost manner. Cost efficiency is usually measured using present net value, al-

though use of benefit-cost ratios and rates of return may be appropriate. (36 CFR 219.3)

Cost Effective

Achieving specified results, including both quantifiable and nonquantifiable values; at the least cost.

Cost, Capital Investment

The cost of man made structures, facilities, or improvements in natural resources used as inputs in production processes to produce outputs over one or more planning periods.

Cost-Effective

Achieving specified outputs or objectives under given conditions for the least cost.

Cost, Fixed

A cost that is committed for the time horizon of planning or the decision being considered. Fixed costs include fixed ownership requirements, fixed protection, short-term maintenance and long-term planning and inventory costs.

Cost, Operational

Costs associated with administering and maintaining National Forest facilities and resource programs. This includes appropriated funds only.

Cost, Variable

A cost that varies with the level of controlled outputs in the time horizon covered by the planning period or decisions being considered.

Council on Environmental Quality (CEQ)

An advisory council to the President established by the National Environmental Policy Act of 1969. It reviews Federal programs for their effect on the environment, conducts environmental studies, and advises the President on environmental matters.

Created Opening

Created openings are openings in the Forest created by the silvicultural practices of shelterwood regeneration cutting at the final harvest, clearcutting, seed tree cutting, or group selection cutting.

Critical Habitat

For threatened or endangered species, the specific areas within the geographical area occupied by the species (at the time it is listed, in accordance with provisions of Section 4 of the Endangered Species Act) on which are found those physical or biological features essential to the conservation of the species. This habitat may require special management considerations or protecting. Protection may also be required for additional habitat areas outside the geographical area occupied by the species at the time it is listed based upon a determination of the Secretary of the Interior that such areas are essential for the conservation of the Species.

Critical Minerals

Minerals essential to the national defense, but whose procurement, while difficult in case of war, is less serious than those of Strategic Minerals.

Critical Window

A control point or area (such as a mountain pass) not included in an existing utility corridor but needed to retain future new utility corridor options.

Cubic Foot

A unit of measure with the dimensions of one foot x one foot x one foot.

Culmination of Mean Annual Increment (CMAI)

The point where the mean annual growth of a timber stand ceases to increase prior to decline. This is calculated by determining the cubic foot per acre volume of a stand of trees divided by the age of the stand.

Cultural Resources

Any site, structure, or object, or group of sites, structures, or objects that have been made, modified, or used by man in the past.

Cumulative Effects

The combined effects of two or more management activities. The effects may be related to the number of individual activities, or to the number of repeated activities on the same piece of ground. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

D

Decision Criteria

Essentially the rules or standards used to evaluate alternatives. They are measurements or indicators that are designed to assist a decisionmaker in identifying a preferred choice from an array of possible alternatives.

Deferred Forest Land

Productive forest land that has been administratively identified for study as possible addition to the National Wilderness Preservation System, or otherwise withdrawn from timber utilization under authority granted in the Code of Federal Regulations.

Deferred-Rotation

Any grazing system which provides for a systematic rotation of the delay or discontinuance of livestock grazing on an area to provide for plant reproduction establishment or restoration of vigor.

Demand

The amount of output that users are willing to take at specific price, time period, and conditions of sale.

Departure

A schedule which deviates from the principle of nondeclining flow of timber harvest by exhibiting an increase in cutting levels above sustainable levels followed by a planned decrease in the timber sale and harvest schedule at some time in the future.

Designated Area (Air Quality)

Those areas delineated in the Oregon and Washington Smoke Management Plans as principal population centers of air quality concern.

Desired Residue Profile

The desired level of both living and dead woody material that is desired by the land manager for a specific site or prescription. Residue includes slash materials remaining from timber harvest, living brush and trees, standing dead trees and snags, and vegetative litter on the forest floor.

Destination Resort

A recreation resort designed for multi-day use in contrast to single day use.

Developed Recreation Site

Distinctly defined-designated- area where facilities are provided for concentrated public use; e.g. campgrounds, picnic areas, boating sites, and ski areas. (Maintenance Levels are defined on the following page.)

Developed Recreation Site Maintenance Levels

Level I - Minimum Level Operation and Maintenance of developed recreation sites at a level that only meets minimum requirements for public health and safety and does not maintain facilities over time. At this level no funding is provided for upgrading of facilities or completion of any portion of the backlog rehabilitation needs associated with developed sites.

Level II - Low Standard Operation and Maintenance of developed recreation sites at the level necessary to maintain facilities over time and protect investments in facilities and to complete approximately 50% of the backlog rehabilitation needs associated with developed sites.

Level III - Standard Service Level Operation and Maintenance of developed recreation sites at a level that will insure normal life expectancy of facilities and at a level that meets Forest service "Green Book" (i.e. Full Service) standards of maintenance, service, compliance and insures the experience level for which the site is designed and meets other aspects of administration as outlined in Forest Service manuals and regulations. At this level one hundred percent of any backlog rehabilitation needs associated with developed sites will be completed.

Diameter Breast High (DBH)

The diameter of a standing tree at a point 4 feet, 6 inches from ground level.

Discount Rate

An interest rate that represents the cost or time value of money in determining the present value of future costs and benefits.

Discount Rate, Real

A discount rate adjusted to exclude the effects of inflation.

Discounting

An adjustment, using a discount rate, for the value of money over time so that costs and benefits occurring in the future are reduced to a common time, usually the present, for comparison.

Dispersed Recreation

Outdoor recreation that takes place outside developed recreation sites or the Wilderness.

Diversity

The distribution and abundance of different plant and animal communities and species within the area covered by a land and resource management plan. (36 CFR 219.3) See also Edge, Horizontal Diversity, And Vertical Diversity.

Drainage Pattern

The configuration or arrangement of streams within a drainage basin or other area.

E

Ecosystem

An interacting system of organisms considered together with their environment; for example, marsh, watershed, and lake ecosystems.

Edge

The boundary between two or more elements of the environment; e.g. field and woodland.

Edge Contrast

A qualitative measure of the difference in structure of two adjacent vegetated areas; for example, low, medium, or high edge contrast.

Effectiveness, Cost

Achieving specified outputs or objectives under given conditions for the least cost.

Effectiveness Index (fire)

See Fire Management Efficiency Index.

Effects

Environmental consequences as a result of a proposed action. Included are direct effects, which are caused by the action and occur at the same time and place, and indirect effects, which are caused by the action and are later in time or further removed in distance, but which are still reasonably foreseeable. Indirect effects may include population growth-inducing effects and other effects re-

lated to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems.

The terms "Effects" and "Impacts" as used in this statement are synonymous. Effects may be ecological (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic quality, historic, cultural, economic, social, or health related, whether direct, indirect, or cumulative. Effects resulting from actions may have both beneficial and detrimental aspects, even if on balance the agency believes that the overall effects will be beneficial (40 CFR 1508.8).

Efficiency, Cost

The usefulness of specified inputs (costs) to produce specified outputs (benefits). In measuring cost efficiency, some outputs (such as environmental, economic or social impacts) are not assigned monetary values but are achieved at specified levels in the least cost manner. Cost efficiency is usually measured using present net value, though use of benefit-cost ratios and rates-of-return may sometimes be appropriate.

Efficiency, Economic

The usefulness of inputs (costs) to produce outputs (benefits) and effects when all costs and benefits that can be identified and valued are included in the computations. Economic efficiency is usually measured using present net value, though use of benefit-cost ratios and rates-of-return may sometimes be appropriate.

Endangered Species

Any species of animal or plant which is in danger of extinction throughout all or a significant portion of its range. Not included are members of the class Insecta which have been determined by the Secretary to constitute a pest whose protection under the provisions of this Act (Endangered Species Act of 1973) would present an overwhelming and overriding risk to man. An endangered species must be designated in the Federal Register by the appropriate Federal Agency Secretary.

Endemic Plant

A plant confined to a certain country or region and with a comparatively restricted geographic distribution.

Enhancement

A short-term management practice which is done with the express purpose of increasing positive aspects of scenic variety where little variety now exists.

Environmental Analysis

An investigation and analysis of alternative actions and their predictable short- and -long-term environmental effects, incorporating the physical, biological economic, social, and cumulative effects. This process provides the information needed for identifying actions that may be

categorically excluded or for preparing environmental documents as required.

Environmental Assessment

A concise public document required by the regulations implementing the National Environmental Policy Act.

Environmental Impact Statement (EIS) and Decision Documents

Refers to a NEPA environmental assessment, environmental impact statement finding of no significant impact, decision notice, notice of intent or record of decision.

Erodible

Susceptible to erosion.

Erosion

The wearing away or detachment of the land surface by running water, wind, ice, or other geological agents, including such processes as gravitation creep.

Erosion (Accelerated)

Erosion much more rapid than normal, primarily as a result of the influence or the activities of man.

Erosion (Natural)

Wearing away of the earth's surface by water, ice, or other natural agents under natural environmental conditions of climate, vegetation, etc., undisturbed by human activity.

Escaped Fire

A fire which has exceeded, or is anticipated to exceed, preplanned initial action capabilities or the fire management direction

Escape Cover

Usually vegetation dense enough to hide an animal; used by animals to escape from potential enemies.

Essential Habitat

Areas designated by the Forest Service Regional Forester that possess the same characteristics of critical habitat as those designated by the Secretary of the Interior or Commerce.

Even-aged Management

The application of a combination of actions that results in the creation of forest stands composed of trees of essentially the same age. Managed even-aged forests are characterized by a distribution of stands of varying ages (and, therefore, tree sizes throughout the forest area). The difference in age between trees forming the main canopy level of a stand usually does not exceed 20 percent of the age of the stand at harvest rotation age. Regeneration in a particular stand is obtained in a short period at or near the time that a stand has reached the desired age or size for regeneration and is harvested. Clearcut, shelterwood, or seed tree cutting methods produce even-aged stands. (36 CFR 219.3)

Even-Flow

Maintaining a relatively constant supply of timber from decade to decade.

Exclusion Area

An area having a statutory prohibition to rights-of-way for linear facilities or corridor designation.

Expected Burned Acreage

The expected annual number of acres burned by fire size class and intensity level for a given program option or budget level. Expected burn acreage must equal or be less than the resource protection objective to be a valid option.

Extended Shelterwood

This is a variation of the shelterwood system design to provide for other resources such as wildlife or scenery considerations. The term extended is used to denote the retention of the old stand for a longer period than is necessary or in many cases desirable for maximum growth of the new stand.

F

Facility Maintenance Class

The rating system used in the Recreation Information Management System to classify the condition and maintenance needs of recreational sites and areas.

Fire Management Analysis Zone

The geographically delineated areas into which the planning unit is divided for the purpose of fire management analysis. The delineation is based upon common fire-behavior characteristics which is the "corner stone" for fire planning and evaluation of fire effects.

Fire Management Efficiency Index

An index based on the FFP cost (less proposed fuels investment 115), expected annual FFP and expected annual net value change for the selected option. These three variables become the targets for the purpose of monitoring plan performance over time. The expected plan performance is adjusted annually based on the actual budget level and actual seasonal index in the monitoring process.

Fire Management Direction

The direction provided by an interdisciplinary team for each separate management area on the Forest. It includes guides by management area for long-term maximum burn acreages, specifying fire size and intensity, which would not adversely affect attainment of resource targets or outputs. In addition, it provides guidelines on desired residue profiles and the use of fire to meet resource prescriptions.

Fire Prevention Levels

Level I-Low Level of Prevention Under this level public contact is incidental; with fire prevention mentioned secondary to other messages. There is infrequent use of fire

regulations. Prevention signing occurs only as part of other informational signing.

Level II-Moderate Level of Prevention Under this level fire prevention contacts are planned; but secondary to other activities. Messages are structured to deal with specific risks. Fire regulations are utilized seasonally with restrictions possible on a site specific basis. Signing is informational and directed at specific risks.

Level III-High Level of Prevention Under this level contacts are planned; and frequent messages are structural with the primary reason for the contact being the fire prevention message or the enforcement of restrictions. Fire restrictions are frequently used with fire regulations in effect during fire season. Signing is primarily directive or restrictive. Fire instructions are often the reason for the contact.

Flood Plains

Lowland and relatively flat areas adjoining inland and coastal water including, as a minimum, that area subject to one percent or greater chance of flooding in any given year.

Forage

All browse and non woody plants available to livestock or wildlife for grazing or harvestable for feed.

Forbs

Non-woody plants, other than grasses. Term refers to feed used by both wildlife and domesticated animals.

Foreground

A term used in visual (scenery) management to describe the stand of trees immediately adjacent to a high-value scenic area, recreation facility, or forest highway. See also Background, Middleground.

Forest Interdisciplinary Team (I.D. Team)

A Team representing several disciplines to insure coordination of the various resources. Team functions include developing the Forest Plan, establishing the standards and requirements by which planning and management activities will be monitored and evaluated, and for completing the annual evaluation report and recommending amendments.

Forest Land

Land at least 10 percent occupied by forest trees of any size or formerly having had such cover and not currently developed for non-forest use. Lands developed for non-forest use include areas devoted to crops, improved pasture, residential or administrative areas, improved roads of any width and adjoining road clearing and powerline clearing of any width. (36 CFR 219.3)

Forest Plan Amendment

Formal alteration of the Forest Plan by modification, deletion or addition based upon nonsignificant or significant changes. Nonsignificant changes are minor modification of management direction. Significant changes are major alterations of specific management prescription direction or

land use designations. Unlike a complete Plan revision; an amendment addresses only the issues that trigger a need for a change. Amendments must satisfy both NFMA and NEPA procedural requirements, including appropriate public notification.

Forest Plan Goal

A concise statement that describes a desired condition to be achieved sometime in the future. It is normally expressed in broad, general terms and is timeless in that it has no specific date by which it is to be completed.

Goal statements form the principal basis from which objectives are developed (36 CFR).

Forest Plan Monitoring

Observing and determining whether Forest Management Direction is being implemented as stated in the Forest Plan.

Forest Plan Objective

A concise, time specific statement of measurable planned results responding to established goals. An objective forms the basis for further planning to define the precise steps to be taken and the resources to be used in achieving identified goals.

Forest and Rangeland Renewable Resources Planning Act (RPA) 1974

An act of Congress requiring the preparation of a program for the management of the National Forest's renewable resources and preparation of land and resource management plans for units of the National Forest System. It also requires a continuing inventory of all National Forest System lands and renewable resources.

Forest-Wide Standard

A principle requiring a specific level of attainment; a rule to measure against. The Forest-wide Standards apply to all areas of the Forest regardless of the other prescriptions applied.

Forplan

A linear programming system used for developing and analyzing Forest Planning Alternatives.

Fuelbreak

Any natural or constructed barrier utilized to segregate, stop, or control the spread of fire.

Fuels

Any material that will carry and sustain a forest fire, primarily natural materials, both live and dead.

Fuel Treatment

The rearrangement or disposal of natural or activity fuels to reduce the fire hazard.

G

Game

Wildlife that are hunted for sport and regulated by State Game regulations.

General Distribution

The geographic area presently occupied, often on a seasonal basis, by a species within the planning area. Distribution is not to be confused with present occupancy of specific habitat(s). Resource management activities will create changes in habitat which will force local shifts in occupancy.

Goal

A concise statement that describes a desired condition to be achieved sometime in the future. It is normally expressed in broad general terms and is timeless in that it has no specific date by which it is to be completed. Goal statements form the principle basis from which objectives are developed. (36 CFR 219.3)

Goods and Services

The various outputs, including on-site uses, produced from forest and rangeland resources. (36 CFR 219.3)

Gradient

Change of elevation, velocity, pressure or other characteristics per unit length.

Group Selection Cutting

Removal of tree groups ranging in size from a fraction of an acre up to about 2 acres in area that is smaller than the minimum feasible for even-aged management of a single stand.

Guideline

An indication or outline of policy or conduct that is not a mandatory requirement (as opposed to a standard, which is mandatory).

H

Habitat

The place where a plant or animal naturally or normally lives and grows.

Habitat Component

A simple part, or a relatively complex entity, regarded as a part of an area or environment in which an organism or biological population normally lives.

Habitat Capability

The estimated ability of an area, given existing or predicted habitat conditions, to support a wildlife, fish or plant population. It is measured in terms of potential population numbers.

Habitat Diversity Index

A measure of habitat diversity improvement expressed as a percentage of optimum size class distribution that is achieved over time.

Harvest Cutting Method

A combination of interrelated actions whereby forests are tended, harvested, and replaced. The combination of management practices used to manipulate the vegetation in forests. Harvest cutting methods are classified as even-aged and uneven-aged.

Heaving

The partial lifting of plants out of the ground, frequently breaking their roots, as a result of freezing and thawing of the surface soil during the winter.

Hiding Cover

Vegetation capable of hiding 90 percent of a standing deer or elk from the view of a human at a distance of 200 feet.

High Standard

Maintaining recreational facilities to the fullest and best standard. High standard includes regular garbage pickup and frequent cleaning of facilities.

High Quality Habitat

Habitat which completely satisfies a species existence requirement.

Horizontal Diversity

The distribution and abundance of plant and animal communities or successional stages across an area of land; the greater the number of communities, the higher the degree of horizontal diversity. This concept is close to, but not exactly the same as, "even-aged management," although each may influence the other. Application of even-aged management, for example, can be designed to accomplish horizontal diversity objectives. See also Vertical Diversity.

Human Resource Programs

Providing human and natural resource benefits through administering and hosting programs in work, training, and education for the unemployed, the under-employed, the elderly, the young and others with special needs.

Hundred Year Flood

Severe flood which, statistically, has a chance of occurring once in a hundred years, or has a 1% chance of occurring each year.

I

Integrated Resource Management Approach

All resources are planned in the same area and scheduled over the next decade using an interdisciplinary approach. All further Forest Plan implementation actions are united and coordinated to achieve Forest Plan goals and objectives.

Interdisciplinary Approach

Utilize a team representing several disciplines to coordinate and integrate planning actions consistent with the principles of Multiple Use Sustained Yield Act.

Impact, Economic

The change, positive or negative, in economic conditions, including distribution and stability of employment and income in affected local, regional, and national economies, which directly or indirectly results from an activity, project, or program.

Indicator Species

A wildlife management scheme in which the welfare of a selected species is presumed to indicate the welfare of other species.

Indicator Species Management

A wildlife management strategy to produce relatively high numbers of selected wildlife species in particular places for particular purposes.

Initial Action

The prompt, preplanned response to a wildfire.

Integrated Land and Resource Management Plan

A Forest Plan which considers all lands and all resources of the National Forest, in contrast to consideration of only part of the Forest's lands or just one of the resources.

Integrated Pest Management

A process for selecting strategies to regulate forest pests in which all aspects of a pest-host system are studied and weighed. The information considered in selecting appropriate strategies includes the impact of the unregulated pest population on various resources values, alternative regulatory tactics and strategies, and benefit/cost estimates for these alternative strategies. Regulatory strategies are based on sound silvicultural practices and ecology of the pest-host system and consist of a combination of tactics such as timber stand improvement plus selective use of pesticides. A basic principle in the choice of strategy is that it be ecologically compatible or acceptable. (36 CFR 219.3)

Intensive Forest Management

A high investment level of timber management that envisions initial harvest, regeneration with genetically improved seedling stock, control of competing vegetation, fill-in planting, precommercial thinning as needed for stocking control, one or more commercial thinnings, and final harvest.

Interdisciplinary Team

A team of people that collectively represent several disciplines and whose duty it is to coordinate and integrate the planning activities. See also Forest Interdisciplinary Team (I.D. Team).

Intermittent Stream

A stream that flows above ground at intervals or only flows periodically during the year

Inventoried Roadless Area

Areas of undeveloped Federal land, greater than 5,000 acres in size, within which there are no improved roads maintained for travel by means of motorized vehicles intended for highway use. Exceptions are those areas less than 5,000 acres manageable in their natural condition, contiguous to existing wilderness, or are of issue to the public.

Irretrievable

Applies to losses of production, harvest, or use of renewable natural resources. For example, some or all of the timber production from an area is irretrievably lost during the time an area is used as a winter sports site. If the use is changed, timber production can be resumed. The production lost is irretrievable, but the action is not irreversible.

Irreversible

Applies primarily to the use of nonrenewable resources, such as minerals or cultural resources, or to those factors, such as soil productivity, that are renewable only over long time periods. Irreversible also includes loss of future options.

Issue

A point, matter, or question of public discussion or interest to be addressed or decided through the planning process.

K

Key Site Riparian Areas

Large riparian areas exhibiting high habitat diversity and outstanding capabilities for producing high quality water, excellent fish spawning and rearing habitat, high quality waterfowl breeding, nesting and resting habitat, wildlife cover and diverse plant communities.

Knutson-Vandenberg Act

Legislation authorizing the collection of money from timber sale receipts for reforestation, stand improvements, and other resource improvement or mitigation projects on timber sale areas.

Kuchler Vegetative Types

Potential natural vegetation of the contiguous United States, classified by A. W. Kuchler.

K-V

An abbreviation of Knutson-Vandenberg.

L

Land Allocation

The assignment of a management emphasis to particular land areas with the purpose of achieving the goals and objectives of that alternative.

Landings

Those designated areas within a timber sale where logs are temporarily stored before transport to a mill.

Life Form

How a species makes its living, also called a niche.

Limiting Habitat

Habitat which completely satisfies existence requirements.

Long-term Sustained Yield Timber Capacity

The highest uniform wood yield from lands being managed for timber production that may be sustained under a specified management intensity consistent with multiple-use objectives. (36 CFR 219.3)

Low Standard

Maintaining recreational facilities to the point that health and safety of the public is the only concern. Services are minimal.

M

M

Thousand

Management Area

An area with similar management objectives and a common management prescription. In Region 6, a management area is the contiguous area assigned to a specific management strategy (the management strategy then becomes the management prescription).

Management Concern

An issue, problem, or a condition which constrains the range of management practices identified by the Forest Service in the planning process. (36 CFR 219.3)

Management Direction

A statement of multiple-use and other goals and objectives, the associated management prescriptions, and standards and guidelines for attaining them. (36 CFR 219.3)

Management Intensity

A management practice or combination of management practices and associated costs designed to obtain different levels of goods and services. (36 CFR 219.3)

Management Practice

A specific activity, measure, course of action, or treatment. (36 CFR 219.3)

Management Prescription

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

Market Resources

Products derived from renewable and nonrenewable resources that have a well-established market value; for example, forage, timber, water, and minerals.

Mass Movement

Downslope, unit movement of a portion of the land's surface; i.e., a single landslide or the gradual simultaneous, downhill movement of the whole mass of loose earth material on a slope face.

Mature Timber

Trees that have attained full development, particularly in height, and are in full seed production.

Maximum Modification

A visual quality objective meaning man's activity may dominate the characteristic landscape but should appear as a natural occurrence when viewed as background.

MBF

Thousand board feet. A measure of wood volume.

MCF

Thousand cubic feet. A measure of wood volume. The conversion ratio for the Mt. Hood National Forest is 5.07 board feet per one cubic foot of wood.

Mean Annual Increment of Growth

The total increase in girth, diameter, basal area, height, or volume of individual trees or a stand up to a given age, divided by that age.

Middleground

The visible terrain beyond the foreground where individual trees are still visible but do not stand out distinctly from the stand.

Mineral Potential

A rating system for mineral resources based on the degree to which certain criteria indicates favorable potential for development of mineral resources.

High Mineral-Resource Potential Exists where geologic, geochemical and/or geophysical characteristics favorable for mineral accumulations are known. This rating covers existing mineral producing areas and possibility of mineral accumulation, and evidence shows that mineralization has occurred. This rating covers existing mineral producing areas and known "Mining Districts".

Moderate Mineral-Resource Potential Exists where geologic, geochemical and/or geophysical characteristics can reasonably be interpreted to be present, but where evidence of mineralization has not yet been found.

Low Mineral-Resource Potential This rating is assigned to areas where geologic, geochemical and/or geophysical characteristics are unfavorable, or where evidence indicates that mineral concentrations are unlikely. This rating also covers areas with obvious but dispersed and apparently uneconomical mineral occurrences.

Unknown Mineral-Resource Potential This rating is used for areas where the level of knowledge of the mineral resource is so inadequate that a classification would be unjustified.

Mineral Withdrawal

The exclusion of locatable mineral deposits from mineral entry on areas required for administrative sites by the Forest Service and other areas highly valued by the public. Public lands withdrawn from entry under the General Mining Laws and/or the Mineral Leasing Laws. Minimum management requirements (MMR's) Requirements on forest management mandated by the Regional Office intended to minimally protect resources such as riparian areas and sensitive species of wildlife. Minimum viable population. The low end of the viable population range. Mining claims that portion of the public estate held by law for mining purposes in which the right of exclusive possession of locatable mineral deposits is vested to the locator of a deposit.

Mitigation

Actions to avoid, minimize, reduce, eliminate, or rectify the impact of a management practice.

MM

Million.

MMBF

Million board feet.

MMCF

Million cubic feet.

Monitoring

A process to collect significant data from defined sources to identify departures or deviations from expected plan outputs.

Modification

A visual quality objective meaning man's activity may dominate the characteristic landscape but must, at the same time, utilize natural established form, line, color, and texture. It should appear as a natural occurrence when viewed in foreground or middleground.

Multiple Use

The management of all the various renewable surface resources of the National Forests so that they are utilized in the combination that will best meet the needs of the American people. The concept also includes making the most judicious use of the land for some or all of these resources or related services over areas large enough to provide sufficient latitude for periodic adjustments in the use to conform to changing needs and conditions. Some lands will be used for less than all of the resources. There will be harmonious and coordinated management of the various resources, each with the other, without impairment of the productivity of the land. Consideration will be given to the relative values of the various resources, and

management will not necessarily favor the combination of uses that will give the greatest dollar return or the greatest unit output.

Multidisciplinary Approach

An approach whereby one of more disciplines representing a unique value or resource provides input to an I.D. Team or to management.

Municipal Supply Watershed

A watershed that provides water for human consumption where Forest Service management could have a significant effect upon the quality of water at the point of intake. The watershed must provide water utilized by a community or any other public water system regularly serving 25 individuals at least 60 days out of the year or provide at least 15 service connections.

N

National Environmental Policy Act (NEPA) (1969)

An Act, to declare a National policy which will encourage productive and enjoyable harmony between man and his environment; to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man; to enrich the understanding of the ecological systems and natural resources important to the nation; and to establish a Council on Environmental Quality.

National Forest Management Act (NFMA)

An Act passed in 1976 amending the Forest and Rangeland Renewable Resources Planning Act. NFMA requires the preparation of Regional and Forest Plans and the preparation of regulations to guide that development.

National Forest Systems

All National Forest lands reserved or withdrawn from the public domain of the United States, all National Forest lands acquired through purchase, exchange, donation, or other means, the National Grasslands and land utilization projects administered under Title III of the Bankhead-Jones Farm Tenant Act (50 Stat. 525, 7 U.S.C. 1010-1012), and other lands, waters or interests therein which are administered by the Forest Service or are designated for administration through the Forest Service as a part of the system. (16 U.S.C. 1608)

Natural Forest

The condition of a forest environment at any point in time including its associated plant and animal communities, which has been reached essentially through the process of natural succession. This process would include the effects of natural catastrophic occurrences.

NDF

An abbreviation of Non-Declining Flow.

NEPA

An abbreviation of National Environmental Policy Act.

Net Public Benefits

An expression used to signify the overall long-term value to the nation of all outputs and positive effects (benefits) less all associated inputs and negative effects (costs) whether they can be quantitatively valued or not. Net public benefits are measured by both quantitative and qualitative criteria rather than a single measure or index. The maximization of net public benefits to be derived from management of the units of the National Forest System is consistent with the principles of multiple-use and sustained-yield. (36 CFR 219.3)

Net Value Change

The estimation process carried out by an interdisciplinary team to assess positive and negative effects of individual resource allocation or management area designation. An estimation of physical effects and economic consequences of various fire intensity levels.

NFMA

An abbreviation of the National Forest Management Act of 1976.

Non-Chargeable Timber Harvest

Timber harvest that is not chargeable to the allowable sale quantity.

Non-Declining Flow (NDF)

A level of timber production assigned so that the planned timber sale and harvest for any future decade is equal to or greater than the planned sale and harvest for the preceding decade.

Non-Game

Any species of wildlife or fish which is not managed or otherwise controlled by hunting, fishing, or trapping regulations.

Non-Market

Products derived from National Forest resources that do not have a well-established market value, for example, recreation, wilderness, wildlife.

Non-Point

Refers to area sources of water pollution such as a watershed in contrast to a point source such as an outlet from a factory.

Noxious Weeds

A plant considered to be extremely destructive or harmful to agriculture and designated by law. An undesirable species that conflicts with, restricts, or otherwise causes problems with the management objectives.

NPB

An abbreviation of Net Public Benefits.

O

Objective

A concise, time-specific statement of measurable planned results that respond to pre-established goals. An objective forms the basis for further planning to define the precise steps to be taken and the resources to be used in achieving identified goals. (36 CFR 219.3)

Occupancy Trespass

The illegal occupation or possession of National Forest land or property.

Off-Road Vehicle (ORV)

Any motorized vehicle designed for or capable of cross-country travel on or immediately over land, water, snow, ice, or other natural terrain. Non-motorized Mountain Bicycle use is also considered an Off-Road Vehicle.

Old Growth Stand

An old-growth stand is defined as any stand of trees 10 acres or greater generally containing the following characteristics: 1) stands contain mature and overmature trees in the overstory and are well into the mature growth stage; 2) stands will usually contain a multilayered canopy and trees of several age classes; 3) standing dead trees and down material are present; and 4) evidence of man's activities may be present but does not significantly alter the other characteristics and would be a subordinate factor in a description of such a stand.

Oligotrophic

Lakes having low nutrient supplies which are poor producers of organic matter.

Opportunity Cost

The value of priced benefits forgone from the most efficient alternative. The reduction in efficiency is caused by achieving nonpriced benefits such as visual quality, threatened and endangered species, an addressing issues and concerns. It is measured in terms of reduction in present net value (PNV).

Optimum Density

For wildlife, the maximum rate of animal stocking possible without inducing damage to vegetation or related resources, may vary from year to year because of environmental and/or population factors.

ORV

An abbreviation for Off-Road Vehicles.

Output

A good, service, or on-site use that is produced from forest and rangeland resources. See FSH 1309.11 for forest and rangeland outputs, codes and units of measure. Examples: X06 - Softwood Sawtimber production - MCF; X80 - Increased Water Yield - Acre feet; W01 - Primitive Recreation Use - RVD's.

Overstory

That portion of the trees in a forest of more than one story, forming the upper or uppermost canopy layer.

P

PAOT

Persons-At-One-Time Public recreational measurement term. The number of people in an area or using a facility at one time.

PARS

The burned acreage and fire occurrence guidelines which represent the annual average long-term fire loss. PARS are expressed by size class and fire intensity levels.

Partial Retention

A visual quality objective where man's activities may be evident but subordinate to the characteristic landscape.

Particulates

A component of polluted air consisting of any liquid or solid particles suspended or falling through the atmosphere.

Patented Mining Claims

A patent is a document which conveys a title. Public law provides that when patented, a mining claim becomes private property and is land over which the United States has no property rights, except as may be reserved in the patent. After a mining claim is patented, the owner does not have to comply with requirements of the General Federal Mining law, but is required to meet State regulations.

Payment in Lieu of Taxes

Payments to local or State governments based on ownership of Federal land and not directly dependent on production of outputs or receipt sharing. Specifically, they include payments made under the Payments in Lieu of Taxes Act of 1976, P.L. 94-565 Stat. 2662; 31 U.S.C 1601-1607 (Note these payments are in addition to payments made from gross receipts from forest products made under the Twenty-Five Percent Fund Act of May 1908).

Persons-At-One-Time (PAOT)

A recreation capacity measurement term indicating the number of people that can use a facility or area at one time.

Planning Area

The area of the National Forest System covered by a regional guide or Forest Plan. (36 CFR 219.3)

Planning Horizon

The overall time period considered in the planning process that spans all activities covered in the analysis or plan and all future conditions and effects of proposed actions which would influence the planning decisions. (36 CFR 219.3)

Planning Period

One decade. The time interval within the planning horizon that is used to show incremental changes in yields, costs, effects, and benefits. (36 CFR 219.3)

Plant Communities

A vegetation complex unique in its combination of plants which occur in particular locations under particular influences. A plant community is a reflection of integrated environmental influences on the site - such as soils, temperature, elevation, solar radiation, slope, aspect, and rainfall.

PNV

An abbreviation of present net value.

Potential Yield

The sustainable output of wood fiber available after the needs of other forest uses have been deducted from the Biological Potential.

Practices

Those management activities that are proposed or expected to occur.

Precommercial Thinning

The selective felling or removal of trees in a young stand, primarily to accelerate diameter increment on the remaining stems, maintain a specific stocking or stand density range, and improve the vigor and quality of the trees that remain.

Prescribed Fire

A wildland fire burning under preplanned specified conditions which will accomplish certain planned objectives. The fire may result from either planned or unplanned ignitions.

Prescribed Natural Fire

The use of unplanned natural ignitions to meet management prescriptions.

Present Net Value (PNV)

The difference between the discounted values (benefits) of all outputs to which monetary values or established market prices are assigned, and the total discounted costs of managing the planning area. (36 CFR 219.3) In Forest Planning; monetary values were assigned to timber stumpage, recreation visitor days (RVD's), wildlife/fish related recreation visitor days (WFVD's), grazing use and mineral outputs.

Preservation

A visual quality objective that allows only ecological changes to take place.

Presuppression

Activities required in advance of fire occurrence to ensure an effective suppression action. It includes (1) recruiting and training fire forces, (2) planning and organizing attack methods, (3) procuring and maintaining fire equipment, and (4) maintaining structural improvements necessary for the fire program.

Price

The unit value of an output expressed in dollars.

Primitive Recreation

Those recreation activities which occur in areas characterized by an essentially unmodified natural environment of fairly large size (2,500 acres or greater).

Production Potential

The capability of the land or water to produce a given resource.

Productive Forest Lands

Forest lands that are capable of producing crops of industrial wood and have not been reserved or deferred from timber management.

Program Development And Budgeting

The process by which forest management activities are proposed and funded.

Program Element

An individual Forest Service area of responsibility, which in combination with other elements, comprises the statutory or Executive directed mission of the Forest Service. Specific Forest Service program elements are defined in the Management Information Handbook (FSH 1309.11).

Programmed Harvest

The part of the potential timber yield that is scheduled for harvesting. Includes salvage and cull timber volumes. It is based on current demand, funding, and multiple use considerations.

Public Access

Usually refers to a road or trail route over which a public agency claims a right-of-way for public use.

Public Issue

A subject or question of widespread public interest relating to management of the National Forest System. (36 CFR 219.3)

Purchaser Credit

Credit earned by the purchaser of a National Forest timber sale in return for construction of contract-specified roads. Earned purchaser credit may be used by the purchaser as payment for National Forest timber removed.

R

Range Allotment

A designated area containing land suitable and available for livestock grazing use upon which a specified number and kind of livestock are grazed under an approved allotment management plan. It is the basic management unit of the range resource on National Forest System lands administered by the Forest Service.

Ranger District

An administrative subdivision of the Forest, supervised by a District Ranger who reports to the Forest Supervisor.

Raptors

Any predatory bird - such as a falcon, hawk, eagle or owl - that has feet with sharp talons or claws adapted for seizing prey and a hooked beak for tearing flesh.

RARE II

An abbreviation of Roadless Area Review and Evaluation II. Rare II was an extension of the Rare I process to inventory and map all roadless areas remaining on National Forests Lands.

Real Dollar Value

A monetary value that compensates for the effects of inflation. (36 CFR 219.3)

Recreation Information Management (RIM)

The Forest Service system for recording recreation facility condition and use.

Recreation Opportunity

An opportunity for a user to participate in a preferred activity within a preferred setting, in order to realize those satisfying experiences which are desired.

Recreation Opportunity Spectrum (ROS)

Land delineations that identify a variety of recreation experience opportunities categorized into six classes on a continuum from primitive to urban. Each class is defined in terms of the degree to which it satisfies certain recreation experience needs. This is measured based on the extent to which the natural environment has been modified, the type of facilities provided, the degree of outdoor skills needed to enjoy the area, and the relative density of recreation use. The six classes are:

1. *Primitive*--Area is characterized by an essentially unmodified natural environment of fairly large size. Interaction between users is very low, and evidence of other users is minimal. The area is managed to be essentially free from evidence of management restrictions and controls. Motorized use within the area is not permitted.

2. *Semiprimitive Nonmotorized*--Area is characterized by a predominantly natural or natural-appearing environment of moderate to large size. Interaction between users is low, but there is often evidence of other users. The area is managed in such a way that minimum on site controls and restrictions may be present, but subtle. Motorized recreation use is not permitted, but local roads used for other resource management activities may be present on a limited basis. Use of such roads is restricted to minimize impacts on recreational experience opportunities.

3. *Semiprimitive Motorized*--Area is characterized by a predominantly natural or natural-appearing environment of moderate to large size. Concentration of users is low, but there is often evidence of other users. The area is

managed in such a way that minimum on site controls and restrictions may be present, but subtle. Motorized recreation use of local primitive or collector roads with predominantly natural surfaces and trails suitable for motor bikes is permitted.

4. *Roaded Natural*--Area is characterized by predominantly natural-appearing environments with moderate evidence of the sights and sounds of man. Such evidence usually harmonizes with the natural environment. Interaction between users may be moderate to high, and evidence of other users prevalent. Resource modification and utilization practices are evident but harmonize with the natural environment. Conventional motorized use is allowed and incorporated into construction standards and design of facilities.

5. *Rural*--Area is characterized by a natural environment that has been substantially modified by development of structures, vegetative manipulation, or pastoral agricultural development. Resource modification and utilization practices may be used to enhance specific recreation activities and to maintain vegetative cover and soil. Sights and sounds of humans are readily evident, and the interaction between users is often moderate to high. A considerable number of facilities are designed for use by a large number of people. Facilities are often provided for special activities. Moderate user densities are present away from developed sites. Facilities for intensified motorized use and parking are available.

6. *Urban*--Area is characterized by a substantially urbanized environment, although the background may have natural-appearing elements. Renewable resource modification and utilization practices are often used to enhance specific recreation activities. Vegetative cover is often exotic and manicured. Sights and sounds of humans are predominant on site and in nearby areas. Facilities for highly intensified motor use and parking are available with forms of mass transit often available to carry people throughout the site.

Recreation Visitor Day (RVD)

A unit for measuring recreation use, with 12 visitor hours in a visitor day. This may consist of one person for 12 hours, 12 persons for one hour, or any equivalent combination of continuous or intermittent recreation use by individuals or groups.

Reforestation

The natural or artificial restocking of an area with forest trees; most commonly used in reference to artificial restocking.

Regeneration

The actual seedlings and saplings existing in a stand; or the act of establishing young trees naturally or artificially.

Regeneration Cut

Any removal of trees to make regeneration possible.

Region

An area covered by a Regional guide. See FSM 1221.3 for organizational definitions.

Regional Forester

The official responsible for administering a single Forest Service region.

Regulated Harvest

Harvest which is a part of the regular annual cut of the Forest. This cut is what the timber management plan is based on.

Regulated Volume

Same as Allowable Sale Quantity.

Rehabilitation

A short-term management alternative used to return existing visual impacts in the natural landscape to a desired visual quality.

Release

Freeing a tree or group of trees from competition by cutting or otherwise eliminating vegetation that is overtopping or closely surrounding them.

Removal Cut (Final Cut)

The removal of the last seed bearing or shelter trees after regeneration is established under a shelterwood method.

Representative Fires

The grouping of fires to allow the evaluation of planned initial action fire fighting forces. The grouping of fire occurrence into representative fires is based on the differences in dispatch response or resource mix within a Fire Management Analysis Zone (FMAZ).

Research Natural Area

An area of land in as near a natural condition as possible that exemplifies typical or unique vegetation and associated biotic, soil, geologic, and aquatic features. The area is set aside to preserve a representative sample of an ecological community primarily for non-manipulative scientific and education purposes.

Reserved Forest Land

Productive public forest land withdrawn from timber utilization through statute or administrative regulations.

Resident Trout

A trout which spends its entire life in fresh water.

Residual Stand

The trees remaining standing after some form of selection cutting is performed on a stand.

Residue

Material which includes both desired and unwanted vegetative residues which result from an activity or natural event.

Resource Protection Objective

A specified statement of measurable results to be achieved within a stated time period. The Fire Management direction established by the Interdisciplinary Team for maximum burn acreage and fire size.

Responsible Line Officer

For land management planning purposes, the Forest Service employee who has been delegated the authority to carry out a specific planning action. (36 CFR 219.3)

Rest-rotation

A system of grazing management which defines systematically recurring periods of grazing and deferment for two or more pastures or management units.

Retention

A visual quality objective where human activities are not evident to the casual forest visitor.

Riparian Areas

These include all bodies of water and adjacent land areas which are influenced by the presence of the water. Wetlands, seeps and springs are also included as riparian areas. Three types of riparian areas are identified in the Mt. Hood Forest Plan:

General Riparian Areas Riparian areas along Class I, II & III streams and all lakes, reservoirs, seep and springs.

Key Site Riparian Areas Riparian areas of high quality and diversity.

Special Emphasis Watersheds Watersheds with high value riparian resources, fish habitat and water sources.

Risk

The degree and probability of loss based on chance.

Runoff

That part of the water which travels over the soil surface to the nearest outlet or channel.

RNA

An abbreviation of Research Natural Area.

Road

A general term denoting a way for purposes of travel by vehicles greater than 40 inches in width.

a. *Forest Arterial Road*. Provides services to large land areas and usually connects with public highways or other Forest arterial roads to form an integrated network of primary travel routes. The location and standard are often determined by a demand for maximum mobility and travel efficiency rather than specific resource management service. It is usually developed and operated for long-term land and resource management purposes and constant service (FSM 7710.51).

b. *Forest Collector Road*. Serves smaller land areas than a Forest arterial road and is usually connected to a Forest arterial or public highway. Collects traffic from Forest

local roads and/or terminal facilities. The location and standard are influenced by both longterm multiresource service needs as well as travel efficiency. May be operated for either constant or intermittent service, depending on land use and resource management objectives for the area served by the facility (FSM 7710.51).

c. Forest Local Road. Connects terminal facilities with Forest collector or Forest arterial roads or public highways. The location and standard are usually controlled by specific resource activity requirements rather than travel efficiency needs (FSM 7710.51).

Roadless Area

See Inventoried Roadless Area.

ROS

An abbreviation of Recreation Opportunity Spectrum.

Rotation Age

The age of a stand when harvested.

Round Wood

Commercially valuable wood that is generally too small to be made into boards.

RPA

The Forest and Rangeland Renewable Resources Planning Act of 1974. Also refers to the National Assessment and Recommended Program developed to fill the requirements of the Act.

RPA Resource Targets

Quantified resource goals stated in the Forest Service Region 6 plan.

RVD's

An abbreviation of Recreation Visitor Days.

S

Sale Schedule

The quantity of timber planned for sale by time period from an area of suitable land covered by a forest plan. The first period (usually a decade) of the selected sale schedule provides the allowable sale quantity. Future periods are shown to ensure that long term sustained yield will be achieved and maintained. (36 CFR 219.3)

Sanitation Cutting (Salvage)

The removal of dead, damaged or susceptible trees primarily to prevent the spread of insect pests or diseases and promote forest hygiene.

Saturation Density

(Same as tolerance density.) This term relates to the requirement of many wildlife species for living space. This condition is most marked in territorial species. Space is the limiting factor to the further increases of the population density of these species.

Scenic Areas

Places of outstanding or matchless beauty which require special management to preserve these qualities. They may be established under 36 CFR 294.1 whenever lands possessing outstanding or unique natural beauty warrant this classification.

Scheduled Timber Harvest

Timber harvest that is chargeable to the annual allowable sale quantity for the Forest.

Scoping Process

Determining the extent of analysis necessary for an informed decision of a proposed action. The process includes: (1) reviewing present Management direction as it relates to the analysis; (2) contacting those publics interested or affected by the proposed action to get their opinions and surface the issues; (3) determining local management concerns. This process continues throughout analysis until a decision is made.

Second Growth

Forest growth that has come up naturally after some drastic interference with the previous forest growth (e.g., cutting, serious fire, or insect attack).

Secondary User Species

Wildlife that occupies a site (cavity in a snag or a den) created by another species.

Sediment

Solid material, both mineral and organic, that is in suspension, and is being transported from its site of origin by air, water, gravity, or ice, or has come to rest on the earth's surface either above or below sea level.

Seed Tree Cutting

Removing all mature trees from a stand except for selected seed-bearing trees retained on site to provide a seed source for stand regeneration.

Selection Cut

Selection cutting is the periodic removal of mature trees individually or in small groups from an uneven-aged forest. By this method, both regeneration cutting and tending of immature stand components are accomplished at each entry.

Semi-primitive Motorized ROS Class

See Recreation Opportunity Spectrum.

Semi-primitive Non-motorized ROS Class

See Recreation Opportunity Spectrum.

Sensitive Species

Those species of plants or animals that have appeared in the *Federal Register* as proposed for classification and are under consideration for official listing as endangered or threatened species, that are on an official State list, or that are recognized by the Regional Forester as needing special management to prevent their being placed on Federal or State lists.

Seral

A biotic community which is a developmental, transitory stage in an ecological succession.

Shelterwood Cutting

Any regeneration cutting in a more or less mature stand designed to establish a new stand under the protection (overhead or side) of the old stand. Usually the shelterwood involves two separate harvest operations. The first harvest (seed cut) is designed to create space and seed production to establish new trees. The second cut (removal cut) is designed to remove the remainder of the old stand before it begins to compete with the new stand for light and nutrients. This is usually within 10 years. (See also Extended Shelterwood.).

Sheet Erosion

The removal of a fairly uniform layer of soil from the land surface by runoff water.

Silvicultural System

A management process whereby forests are tended, harvested, and replaced resulting in a forest of distinctive form. Systems are classified according to the logging method that removes the mature crop and provides for regeneration and according to the type of forest thereby produced. (36 CFR 219.3)

Silviculture

The art and science of growing and tending forest vegetation for specific management goals.

Site Index

A numerical evaluation of the quality of land for plant productivity which uses height growth as a function of age.

Site Productivity

Production capability of specific areas of land to produce defined outputs such as AUMs, cubic feet/acre/yr., etc.

Size Class

For purposes of Forest planning, size class refers to the three intervals of tree stem diameter used for classification of timber in the Forest Plan data base: less than 5" diameter = seedling/sapling five to 8" diameter = pole timber greater than 8" diameter = sawtimber

Slash

The wood residue left on the ground after timber cutting and/or accumulating there as a result of storm, fire, or other damage. It includes unused logs, uprooted stumps, broken or uprooted stems, branches, twigs, leaves, bark, and chips.

Slope

An inclined ground surface, the inclination of which is expressed as a ratio of horizontal distance to vertical distance. The face of an embankment or cut section.

Small Game

Birds and small mammals typically hunted or trapped.

Snag

A standing dead tree.

Smolt

A young salmon during its migration downstream to the sea after hatching.

Socioeconomic

Pertaining to, or signifying the combination or interaction of, social and economic factors.

Soil

The unconsolidated mineral and organic material on the immediate surface of the earth.

SOHA

(Spotted Owl Habitat Area.) An area containing the home range of one or more owl pairs established for the propagation and protection of the species in accordance with a management plan.

Sound Wood

Timber that is free from defect, damage, or decay; i.e., in solid, whole, good condition.

Special Emphasis Watersheds

This designation is applied to selected watersheds where special management emphasizes unusually high combinations of riparian resource values and high sensitivity due to generally demanding site conditions and where the goal is to maintain or improve habitat conditions for the sustained, long-term production of fisheries and high quality water.

Species Richness Management

A wildlife management strategy to maintain viable populations of all resident species.

Stand

Timber possessing uniformity as regards to type, age class, risk class, vigor, size class, and stocking class.

Standard

A principle requiring a specific level of attainment, a rule to measure against.

Strategic Minerals

Those minerals of which the U.S. imports 50 percent or more from foreign sources (based on 1978 U.S. Bureau of Mines figures).

Successional Stage

A stage or recognizable condition of a plant community that occurs during its development from bare ground to climax. For example, coniferous forests in the Blue Mountains progress through six recognized stages: grass-forb; shrub-seedling; pole-sapling; young; mature; old growth.

Suitability

The appropriateness of applying certain resource management practices to a particular area of land, as determined by an analysis of the economic and environmental consequences and the alternative uses foregone. A unit of land

may be suitable for a variety of individual or combined management practices. (36 CFR 219.3)

Supply

The amount of an output that producers are willing to provide at a specific price, time period, and condition of sale.

Suppression

The action of extinguishing or confining a fire.

Surface Resources

Renewable resources located on the earth's surface in contrast to ground water and mineral resources located below the earth's surface.

Surface Runoff

Water that flows over the ground surface and into streams and rivers.

Sustained Yield Of Products And Services

The achievement and maintenance in perpetuity of a high-level annual or regular periodic output of the various renewable resources of the National Forest System without impairment of the productivity of the land. (36 CFR 219.3)

T

Targets

Output accomplishments assigned to the Forest by the Forest Service Regional Forester. A statement used to express planned results to be achieved within a stated period of time.

Thermal Cover

Cover used by animals to lessen the effects of weather; for elk, a stand of coniferous trees 12 meters (40 feet) or more tall with an average crown closure of 70 percent or more; for deer, cover may include saplings, shrubs, or trees at least 1.5 meters (5 feet tall) with 75 percent crown closure.

Thermal Gradient

The rate of change in heat, or temperature, of the earth's crust as you get deeper in the earth. Usually obtained from drill core sampling. Often the thermal gradient is used in analysis of an area's potential for geothermal energy development.

Threatened Species

Any species of animal or plant which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range and which has been designated in the Federal Register by the Secretary of Interior as a threatened species.

Tiering

The coverage of general matters in broader environmental impact statements with subsequent, narrower statements or environmental analyses incorporating by reference the

general discussions and concentrating solely on the issues specific to the statement subsequently prepared. Tiering is appropriate when the sequence of statements or analyses is: (a) from a program, plan, or policy environmental impact statement to a program, plan, or policy statement or analysis of lesser scope to a site-specific statement or analysis. (b) from an environmental impact statement on a specific action at an early stage to a supplement or a subsequent statement or analysis at a later stage. Tiering in such cases is appropriate when it helps the lead agency to focus on the issues which are already ripe for decision and exclude from consideration issues already decided or not yet ripe.

Timber Classification

Forest land is classified under each of the land management alternatives according to how it relates to the management of the timber resource. The following are definitions of timber classifications used for this purpose.

1. *Non-Forest*--Land that has never supported forests and land formerly forested where use for timber production is precluded by development or other uses.
2. *Forest*--Land at least 10-percent stocked (based on crown cover) by forest trees of any size, or formerly having had such tree cover and not currently developed for nonforest use.
3. *Suitable*--Commercial forest land identified as appropriate for timber production in the Forest planning process.
4. *Unsuitable*--Forest land withdrawn from timber utilization by statute or administrative regulation (for example, wilderness), or identified as not appropriate for timber production in the Forest planning process.
5. *Commercial Forest*--Forest land tentatively suitable for the production of continuous crops of timber and that has not been withdrawn from timber utilization.

Timber Production

The purposeful growing, tending, harvesting, and regeneration of regulated crops of trees to be cut into logs, bolts, or other round sections for industrial or consumer use. For planning purposes, the term "timber production" does not include production of fuelwood. (36 CFR 219.3)

Timber Stand Improvement (TSI)

The elimination or suppression of the less desirable vegetation in favor of the more desirable tree growth. It includes thinning, cleaning, weeding, and release cuttings.

Tolerant Species

Plants that grow well in shade.

Transitory Range

Land that is suitable for grazing use of a nonenduring nature over a period of time. For example, on particular disturbed lands, grass may cover the area for a period of time

before being replaced by trees or shrubs not suitable for forage.

Turbidity

The degree of opaqueness, or cloudiness, produced in water by suspended particulate matter, either organic or inorganic. Measured by light filtration or transmission and expressed in Jackson Turbidity Units (JTU).

Twenty-five Percent Fund Act Of 1908

This Act provided that Twenty-Five per cent of all moneys received during any fiscal year from each National Forest; shall be paid, at the end of each year, by the Secretary of the Treasury to the State in which each National Forest is located. This money goes to the counties based on the proportion of the National Forest in the respective counties. This payment is in addition to the Payments in Lieu of Taxes made under the Payment in Lieu of Taxes Act of 1976.

U

Uncertainty

Whenever a variety of outcomes are possible and a probability of any specific outcome cannot be assigned with any degree of accuracy.

Understory

Vegetation growing under a higher canopy.

Uneven-aged Management

The application of a combination of actions needed to simultaneously maintain continuous high forest cover, recurring regeneration of desirable species, and the orderly growth and development of trees through a range of diameter or age classes. This management must provide a sustained yield of forest products. Cutting is usually regulated by specifying the number or proportion of trees of particular sizes to retain within each area, thereby maintaining a planned distribution of size classes. Cutting methods that develop and maintain uneven-aged stands are single-tree selection and group selection. (36 CFR 219.3)

Uniform Flow

A state of steady water flow where the mean velocity and cross sectional area are equal at all sections.

Unroaded Acres

Those areas of undeveloped Federal land within which there are no improved roads maintained for travel by means of vehicles intended for highway use.

Utilization Standards

Standards guiding the use and removal of timber which is measured in terms of diameter at breast height (d.b.h.), top diameter inside the bark (top d.i.b.), and percent "soundness" of the wood.

Unplanned Ignition

A fire started at random by either natural or human caused, or a deliberate incendiary fire.

Unregulated Timber Management

Timber cut from those lands that are not organized to provide sustained yields of timber.

Utility and Transportation Corridors

A strip of land designated for the transportation of energy, commodities, and communications by railroad, state highway, electrical power transmission (69 KV and above), oil and gas and coal slurry pipelines 10 inches in diameter and larger, and telecommunication cable and electronic sites for interstate use. Transportation of minor amounts of power for short distances, such as short feeder lines from small power projects including geothermal or wind, or to serve customer subservice substations along the line, are not to be treated within the Forest Plan effort.

V

Value Analysis

A systematic approach to analyzing the function of an item or system to achieve the required results at a minimum total cost consistent with planned objectives.

Value, Market

The unit price of an output normally exchanged in a market after at least one stage of production, expressed in terms of what people are willing to pay as evidenced by market transactions.

Value, Nonmarket

The unit price of a nonmarket output not normally exchanged in market at any stage before consumption, and thus must be imputed from other economic information.

Variety Class

A classification system for establishing three visual landscape categories according to the relative importance of the visual features.

Viable Population

A population which has adequate numbers and dispersion of reproductive individuals to ensure the continued existence of the species population on the planning area.

Viewshed

The total landscape seen or potentially seen from all or a logical part of a travel route, use area, or water body.

Primary Viewshed. The landscape seen from a designated travel route, or designated use area, which has high volume of use, long duration of use, or is a major access to the Forest. The same as Level I Sensitivity to scenic quality.

Secondary Viewshed The landscape seen from a designated travel route, or designated use area, with low use volume, short use duration, or is a minor access route to the Forest. Same as Level II Sensitivity to scenic quality.

Visitor Information Service (VIS)

Activities which interpret for visitors, in layman's language, Forest management, protection, utilization, and research. It also includes interpretation of local botany, geology, ecology, zoology, history, and archaeology.

Visual Management System

The management system used to protect and enhance the visual resource.

Visual Quality Objectives (VQO)

Categories of acceptable landscape alteration measured in degrees of deviation from the natural-appearing landscape.

Visual Resource (Forest Scenery)

The composite of basic terrain, geologic features, water features, vegetative patterns, and land-use effects that typify a land unit and influence the visual appeal the unit may have for visitors. Visual resource categories include Retention (R), Partial Retention (PR), and Modification (M).

VQO

An abbreviation of visual quality objective.

W

Water Quality

The biological, physical, and chemical properties of water that make it suitable for given specified uses. Definition of water quality for forest areas is difficult because of the wide range of downstream uses.

Watershed

The line separating head-streams which flow to different river systems; it may be sharply defined (crest of a ridge), or indeterminate (in a low undulating area).

Wetlands

Areas that are inundated by surface or ground water with a frequency sufficient to support a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. (Executive Order 11990.) Under normal circumstances the area does or would support a prevalence of vegetative or aquatic life.

WFUD'S

An abbreviation of Wildlife and Fish User Days.

Wild And Scenic Rivers

Those rivers or sections of rivers designated as such by congressional action under the 1968 Wild and Scenic Rivers Act, as supplemented and amended, or those sections of rivers designated as wild, scenic, or recreational by

an act of the Legislature of the State or States through which they flow. Wild and scenic rivers may be classified and administered under one or more of the following categories:

1. *Wild River Areas*--Those rivers or sections of rivers that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted. These represent vestiges of primitive America.

2. *Scenic River Areas*--Those rivers or sections of rivers that are free of impoundments, with watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads.

3. *Recreational River Areas*--Those rivers or sections of rivers that are readily accessible by road or railroad, that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past.

Wilderness

Areas designated by congressional action under the 1964 Wilderness Act. Wilderness is defined as undeveloped Federal land retaining its primeval character and influence without permanent improvements or human habitation. Wilderness areas are protected and managed to preserve their natural conditions, which generally appear to have been affected primarily by the forces of nature, with the imprint of human activity substantially unnoticeable; have outstanding opportunities for solitude or for a primitive and unconfined type of recreation; include at least 5,000 acres or are of sufficient size to make practical their preservation, enjoyment, and use in an unimpaired condition; and may contain features of scientific, educational, scenic, or historical value as well as ecologic and geologic interest.

Wildfire

Any wildland fire not designated and managed as a prescribed fire within an approved prescription.

Wildlife And Fish User Day (WFUD)

One WFUD consists of 12 hours of recreation use that is the result of fish or wildlife resources.

Winter Range

The area available to and used by big game through the winter season.

Withdrawal

An order removing specific land areas from availability for certain uses.

INDEX

NOTE: Before using Index, check Table of Contents. The Index does not include words listed in the Table of Contents.

Abbot Road

chapter

III:98

Air Quality

chapter

III:15,16

IV:10,34

Anadromous fish

chapter

III:25-27

IV:10,53

Analysis of the Management Situation (AMS)

chapter

I:2

II:4-6

Aquatic habitat

chapter

I:11

II:33,36

III:11,13,14,19,25-29

IV:22,24-28,30,31,33-35,53

Austin Hot Springs

chapter

IV:52

Badger Creek

chapter

IV:29,31

Badger/Creek, Wilderness

chapter

III:81

IV:35,36

Badger/Jordan

chapter

III:8,34,62

IV:27,28

Badger, unroaded area

chapter

IV:56,57

Bagby Hot Springs

chapter

III:3,95

Bagby Hot Springs, proposed SIA

chapter

II:18,19,21,23-26

III:3,87,95

IV:58,59

Bagby Hot Springs, viewshed

chapter

IV:67,68

Bagby, RNA

chapter

III:21

Bald Eagle

chapter

IV:37

Barlow Road

chapter

III:62,68,96-98,103

IV:72

Barlow Road, proposed SIA

chapter

II:21,23-26

III:86

IV:58,59

Barlow Tollgate, SIA

chapter

III:86
 IV:58,59
Big Bend, proposed RNA
 chapter
 II:18,19,23-26
Big Bend Mountain, RNA
 chapter
 III:21
Boulder Creek
 chapter
 IV:31
Bull Run
 chapter
 I:3,4,6,11
 II:11,12,16,17,19,20,30,64
 III:8,11,20,23,34,40,62,71,95
 IV:7,17,19,25,26-29,44
Bull Run Additions, proposed RNA
 chapter
 II:18,19,23-26
Bull Run, RNA
 chapter
 II:23
 III:21
 IV:65,67
Bull of the Woods, Wilderness
 chapter
 III:82
Bull of the Woods, unroaded area
 chapter
 IV:56,57
Bureau of Land Management
 chapter
 IV:40
Cable yarding
 chapter
 IV:6,9
Cary/Austin Hot Springs
 chapter
 III:3

Clackamas County
 chapter
 II:56
 III:38,39,53,82,99,102,103
 IV:41,69
Clackamas Lake, proposed SIA
 chapter
 II:26
 III:87
 IV:59
Clackamas River
 chapter
 I:14
 III:1,3,8,10,14,26,27,29,37,60-62,65,74,76,77
 IV:2,17,26-29,33,51-53,67,68
Class I Airshed Areas
 chapter
 IV:10,11
Class I streams
 chapter
 IV:31,33
Class II streams
 chapter
 IV:31,33
Class III streams
 chapter
 IV:31,33
Clean Air Act
 chapter
 IV:10
Clear Creek
 chapter
 IV:31
Clearcut harvest
 chapter
 III:36,52,55,56
 IV:15,16,62,65,78
Cloud Cap Inn
 chapter
 III:62,67,95,96

Cloud Cap-Tilly Jane, proposed SIA

chapter

II:26

III:87,103

IV:59

Collawash River

chapter

III:8,10,26

IV:2,5,26,28,29

Columbia Basin Fish and Wildlife Program

chapter

II:63

IV:29,30,53

Columbia Gorge

chapter

I:4,6

II:13,63

III:3,8,16,19,23,24,26,31,32,34,40,41,62,
70,72,75,76,81,100,102,103

IV:45,60

Columbia Gorge Old Wagon Road, SIA

chapter

III:86

IV:58,59

Columbia Gorge, proposed SIA

chapter

II:18,19,21,22-2

Columbia Gorge, viewshed

chapter

IV: 62,65,67,68

Columbia River

chapter

I:4

III:2,25-29,32,39,62,95

IV:17,26-29

Columbia River, Intertribal Fish Commission

chapter

I:10

IV:10

Columbia River Gorge National Scenic Area

chapter

I:6

II:63

III:67

IV:60

Columbia Wilderness

chapter

III:79-82

Community impacts

chapter

II:18-26,56

IV:41-47,78

Compaction, soil

chapter

III:5,6,8,52

IV:5,6,8,9,76,77

**Comprehensive Plan for Production and Management of
Oregon's Anadromous Salmon and Trout**

chapter

IV:30

Conflicts (potential) with other agencies

chapter

IV:1,4,9,10,11,22,30,36,46,49,53,58,60,69,72

Culmination of Mean Annual Increment (CMAI)

chapter

II:17

IV:78

Cultural Resources

chapter

IV:70,77,78

Cumulative effects

chapter

I:11

IV:1,3,8,9,20,21,24,36,40,49,53,58,60,69,72

Deer

chapter

III:31,33,35,45,46,52,76

IV:37-40

Departure from non-declining evenflow (Departure)

chapter

II:11-15	chapter
IV:18,19,20,21,39,75,76	III:86
Deschutes River	IV:58,59
chapter	Fertilization
IV:29	chapter
Disturbed areas	IV:5,6,9,19,20
chapter	Fifteenmile Creek
IV:2,69	chapter
Diversity, plant and animal	III:14,27
chapter	IV:22,27,29,31
II:14,15	Firewood
IV:18,37,38,39	chapter
Dodson, community	IV:9,12,44
chapter	Fish Creek
III:11	chapter
Dufur, community	III:3,10,14,29,31,65
chapter	IV:2,26,29
IV:27,79	Fish habitat
Dufur Mill Road, viewshed	chapter
chapter	II:2,4,7,10,11,13,15,18-25,36,47-49
IV:68	IV:6,9,16,19,20,24-26,28-31,34,35,49,54
Eagle, unroaded area	Five-mile Creek
chapter	chapter
IV:56,57	III:10,14
Earth flows	Forest and Rangeland Renewable Resources Planning
chapter	Act of 1974 (RPA)
II:13,16	chapter
III:2,3	I:1
IV:1,2,3,8,25	II:2,19,60,63
Elk	III:48
chapter	IV:53,58
III:31,33,35,45,46,52,76	Forest Area of Influence
IV:37,38,39,40	chapter
Employment	IV:41-46
chapter	Forestry Program for Oregon, 1980 (FPFO)
IV:41-47,78	chapter
Energy	II:12,45-47
chapter	III:48
IV:73,74,75	IV:22,46,53,58
Face of the Columbia Gorge, proposed SIA	Gate Creek

chapter
IV:31

Grey Squirrel
chapter
III:31

Government Camp
chapter
IV:44

Gumjuwac-Tolo, proposed RNA
chapter
II:23-26
III:23

Highway 26, corridor
chapter
I:16,
III:102

Highway 26, east viewshed
chapter
IV:68,69

Highway 26, west viewshed
chapter
IV:62,65,67-69

Highway 35, viewshed
chapter
IV:62,65,67-69

Highway 216, viewshed
chapter
IV:67-69

Hood River
chapter
II:63
III:8,10,26,31,37,61,62,74,76,95,100

Hood River, community
chapter
III:73,103

Hood River County
chapter
II:56,63
III:38,39,41,43,53,103
IV:41,45,69

Hot Springs Fork
chapter
III:3,10
IV:2,26

Hot Springs Fork, viewshed
chapter
IV:67,68

Huckleberries
chapter
IV:72

Income
chapter
IV:41-47

Indicator Species
chapter
III:27,33,34

Insect epidemics, pest, and disease
chapter
IV:16,19,23,35

Jefferson County
chapter
III:53

Key Site Riparian Habitat Management Areas
chapter
II:7,33,58
IV:27,28,31,33

Lakes and reservoirs
chapter
IV:33,49

Land Stability
chapter
IV:2-5

Larch Mountain, proposed SIA
chapter
II:21-24,26
III:87
IV:58,59

Larch Mountain Salamander
chapter
III:32,34

Larch Mountain, viewshed	IV:6-9,3
chapter	Management indicator species
III:62	chapter
IV:68	IV:37-39
Larch Unroaded Area	Marion County
chapter	chapter
IV:56,57	III:53
Little Crater Lake Expansion, proposed SIA	Mass wasting
chapter	chapter
II:22-24,26	IV:2,35
III:87	Maupin, community
IV:58,59	chapter
Little Crater Lake, SIA	IV:45
chapter	Maximum Modification, VQO
II:22	chapter
III:3,86	III:90
IV:58,59	IV:62
Livestock	Miles Creek
chapter	chapter
III:45,46	III:8
IV:21,22,29,30,40	IV:17,27,28,31
Long-term Sustained Yield (LTSY)	Mill City
chapter	chapter
IV:75,76	IV:45
Lost Lake, proposed SIA	Mill Creek, RNA
chapter	chapter
II:22-24,26	III:21
III:74,87	Mill Creek, South Fork of
IV:58,59	chapter
Lost Lake, viewshed	IV:2
chapter	Mill Creek Buttes, proposed SIA
IV:65,67,68	chapter
Lower Clackamas River, viewshed	II:18,19
chapter	III:88
IV:67,68	IV:59,6
Lyons, community	Minerals
chapter	chapter
IV:45	IV:77
Machine piling of debris	Minimum Management Requirements (MMRs)
chapter	chapter

IV:17,25,28,38,39,44,50,56

Mitchell Flats, proposed SIA

chapter

II:21-24,26

III:87

IV:58,59

Mitigation

chapter

IV:1,4,9,11,12,22,23,27,31,33,34,36,39,40,46,49,54,
57,58,69,71,72,73

Modification, VQO

chapter

III:90

IV:62

Molalla, community

chapter

IV:43

Monitoring

chapter

I:2

IV:2,3,31,76

Mount Hood

chapter

I:6

III:2,8,10,15-17,24,62,67,75,76,81,90,95

Mt. Hood, community

chapter

III:99

IV:44

Mt. Hood, corridor

chapter

III:38,40,100

IV:43-45

Mt. Hood Meadows, viewshed

chapter

IV:62,65,67,68

Mt. Hood Additions, unroaded area

chapter

IV:56,57

Mt. Hood Wilderness Area

chapter

III:60,79,81-83,103

IV:1

Mt. Jefferson Wilderness Area

chapter

III:98,99

IV:10,73

Multnomah County

chapter

II:56,63

III:38,53,102

IV:41,69

Multnomah Falls

chapter

I:4

III:43,67,72,74

Multnomah Falls Lodge

chapter

III:67,95,96

McQuinn Strip lands

chapter

III:98

IV:45

National Environmental Policy Act of 1969 (NPA)

chapter

I:1

National Forest Management Act of 1976 (NFMA)

chapter

I:2

II:2,10,14-16,18,60

National Register of Historic Places

chapter

IV:73

Native Americans

chapter

III:92,95,97-99

IV:43,45,70-73

Northwest Power Planning Council

chapter

III:27

IV:29,30,53

Nutrient cycling

chapter

IV:23,34,35

Oak Grove Fork

chapter

III:3

IV:2,26-28,33

Olallie Lakes area

chapter

II:13

IV:54,56-60,62,65,67,68,73

Olallie Lake, proposed SIA

chapter

II:20,21,23,24,26

III:86

Olallie Lakes, viewshed

chapter

IV:62,65,67,68

Old-growth

chapter

I:7-9,11-14

III:30,31,34,36,52,88

IV:15,16,18,20,21,28,37,40,54,58

Oneonta Gorge, SIA

chapter

III:86

IV:58,59

Openings, created

chapter

III:52

IV:5,78

Oregon Department of Environmental Quality

chapter

IV:11,36

Oregon Department of Fish and Wildlife

chapter

I:9,10,12,16

III:27-29,34

IV:10,25,30,40,53

Oregon Department of Forestry

chapter

I:8

III:48

IV:22,46

Oregon Department of Forestry Smoke Management Plan

chapter

IV:11,13

Oregon Department of Transportation

chapter

I:13

III:64

Oregon, State of

chapter

III:47,4

Oregon State Historic Preservation Office

chapter

IV:72,73

Oregon State Scenic Waterways

chapter

IV:53

Oregon Wild Fish Policy

chapter

IV:30

Oregon Wilderness Act of 1984

chapter

II:12,14,16

I-15

Outdoor Education, management area

chapter

II:34

Parkdale Lava Beds, proposed SIA

chapter

II:22-26

III:3,87,103

IV:58,59

Partial Retention, VQO

chapter

III:90

Payments in lieu of taxes

chapter

II:56

III:42,53

IV:41,43-45,78

Payments to Counties

chapter

I:16

III:42,53,56,57

IV:41-45

Pileated woodpecker

chapter

II:17,37,39,40,79

III:31

IV:17,37,39,40,79

Pine marten

chapter

II:7,19,36,58

IV:17,37,39,40,79

Pine/Oak Habitat, management area

chapter

II:35

Portland, City of

chapter

I:4,6

II:14,30,63

III:11,37-39,81

IV:26,45,78

Portland, metropolitan area

chapter

I:4,6,14

III:15,16,28,29,38,39,42,43,71,101,103

Prescribed burning

chapter

IV:10-13,22,23,34-36

Preservation, VQO

chapter

III:90

Productivity, long-term

chapter

IV:75-78

Public Law 95-200

chapter

II:16

III:23

IV:19,26,27

Rain-on-snow phenomenon

chapter

IV:3,4

Recreation

chapter

II:18-26,51-53

IV:40,44,47-58,70,78

Recreation, developed

chapter

II:33,52,58

IV:47,49,50

Recreation, dispersed

chapter

II:53,54

IV:47-57

Recreation Opportunity Spectrum

chapter

IV:47,48,50-58

Recreation, roaded

chapter

II:32,35

IV:47,49-53

Recreation, unroaded

chapter

II:32,58

IV:20,47-58

Reforestation

chapter

IV:16-20,22,23

Research Natural Areas

chapter

II:31

IV:48,56,65,79

Retention, VQO

chapter
 III:90
Rhododendron, community
 chapter
 IV:44
 Riparian areas
 chapter
 IV:8,16-20,22-24,28,30,31,33,35,58
Riparian, General management area
 chapter
 IV:24,28
Riparian, Special Emphasis
 chapter
 IV:24,27,31
Roadless Area
 chapter
 I:12-15
Roads
 chapter
 I:12
 III:33,62-66,71,88,96
 IV:3,5,6,34,38-40,45,47-62,65,67-69
Roadless Area Review & Evaluation (RARE II)
 chapter
 I:15
 III:84,85
 IV:56
Roaring River
 chapter
 II:67
 III:77
 IV:50
Roaring River, proposed SIA
 chapter
 II:18,19,21-24,26
 III:87
 IV:58,59
Roaring River, unroaded area
 chapter
 IV:56,57

Rock Creek
 chapter
 IV:29
Salmon-Huckleberry, unroaded area
 chapter
 IV:56
Salmon-Huckleberry Wilderness
 chapter
 III:81
Salmon River
 chapter
 I:14,26,27,65,76,77,79
 II:13,63,67
 III:26,27,65,76,77,79
 IV:27,51
Salmon River Meadows
 chapter
 IV:51
Sandy River
 chapter
 II:63
 III:8,10,26,74,76
 IV:28
Scenic Viewsheds, management area
 chapter
 II:35
Sediment
 chapter
 I:11
 III:7,8,10,11,13,19,20,36,60,65
 IV:2,3,5,7,8,10,25,27,29,35,78
Seed tree harvest
 chapter
 IV:22
Selection harvest
 chapter
 III:55-57
 IV:15,23
Sensitive Species, plants and animals
 chapter

III:20,23-25,52

Shelterwood harvest
chapter
III:55,56
IV:15,22,23

Silvergrey squirrel
chapter
III:76
IV:37-40,79

Snags
chapter
IV:22,37,40,79

Soil
chapter
III:5,16,97
IV:2,5,6,9,10,34,35,54,70,76,77

Soil productivity
chapter
III:6
IV:5,6,8,34,76,77

Soil, surface erosion
chapter
III:1,5,8,11,27,66,97
IV:2,6,9,35

Special Emphasis-Watershed Area
chapter
II:58
IV:27

Special Interest Areas
chapter
II:32,58
IV:48,50,58-60,79

Spotted owl
chapter
I:11,12,14
II:7,19,33,58
III:32-34
IV:17,37-40,79

Squaw Meadows, proposed SIA
chapter

II:18,19,23,24
III:87
IV:58-60

Steelhead
chapter
IV:29

Still Creek
chapter
III:10,27,65
IV:27,28

Streamside, management areas
chapter
IV:17

Stream temperatures
chapter
IV:25,29

Sugar Pine, proposed SIA
chapter
II:22-24,26
III:87
IV:58-60

The Dalles, City
chapter
III:11,81,103
IV:27,78

The Dalles Watershed
chapter
II:59
III:103
IV:17,78

Thinning, commercial
chapter
IV:13,15,18

Thinning, precommercial
chapter
IV:13,15,19,2

Threatened and Endangered Species
chapter
III:23-25,32,33

Threemile Creek

chapter
IV:29

Timber harvest rate
chapter
IV:2,3,13,16,18-20,40,68-70

Timber resource
chapter
II:18-20,22-25,37,38
IV:2,3,5,13,15-20,22-24,26,35-37,
39,40,43-47,49-52,54,56-60
62,65,67-70,75-78

Timberline Lodge
chapter
II:13
III:43,67,68,72-74,95-97
IV:51,72

Timberline, viewshed
chapter
IV:62,65-68

Timothy Lake
chapter
III:26,74

Tractor skidding
chapter
IV:5-9

Trails
chapter
IV:48,49

Trillium Lake
chapter
III-74

Trout, wild
chapter
IV:29

Turkey
chapter
III:31,76
IV:37-40,79

Twin Lakes
chapter
IV:56,57

Tygh Creek
chapter
IV:29

Tygh Valley
chapter
IV:43,45

Unacceptable Modification, VQO
chapter
III:90
IV:62

Uneven-aged management
chapter
IV:23

Unroaded areas
chapter
I:14
II:11,13,18-20,22-26,54,55
III:84,85
IV:18,56-58,77

Upper Clackamas River, viewshed
chapter
IV:68

Upper Hood River, viewshed
chapter
IV:67,68

Vegetation communities
chapter
IV:15,16,37
Vegetation (succession) stages
chapter
IV:15,16,37-40,50-54,58

Viewsheds
chapter
II:54
IV:60-70

Visual quality
chapter
II:11,37,54
III:90,92

IV:10,11,13,20,23,50-54,57,58,60-70,78

Warm Springs, Confederated Tribes of
chapter

III:25,28,38,103

IV:10,43,45,60,73

Warm Springs, Indian Reservation
chapter

I:4,16

III:41,49,95,98,99,103

Wasco County
chapter

II:56,63

III:38-40,43,49

IV:41,45

Water quality
chapter

I:8,10

II:4,11,13-15,19-25,30,36,47-49

III:8,11,13,24,27,28,45,65

IV:6,8,9,16,19,24,29,35,49,70,77

Water temperature
chapter

III:14,20,27,36

Water yield
chapter

III:65

IV:3-5

Watershed condition
chapter

II:36

IV:24,25

White River
chapter

I:14

III:8,10,25,26,76,77,79,103

IV:22,26-29,31,33,52,53,54

Wild, Scenic, and Recreation Rivers
chapter

II:34,58

IV:50-54

Wilderness
chapter

I:15

II:31,52

III:36,64,79,81-83

IV:10,11,35,47,54-58,60,73,79

Wilderness Act of 1964
chapter

III:79,83

Wilderness Act, Oregon
chapter

III:79,84,85

Wildfires
chapter

IV:10,13,24,34-36

Wildlife habitat
chapter

II:11,13,18-26,37,50

IV:16-18,20,22-24,35,37-40,49,54,70

Willamette Basin Fish Management Plan
chapter

IV:30,53

Wind Creek, unroaded area
chapter

IV:56,57

Winter Recreation, management
chapter

II:34,58

Woody debris
chapter

IV:16,22,50-52

Yarding unmerchantable material (YUM)
chapter

IV:12,22,35,36

Zigzag
chapter

IV:44