



U.S. Department of the Interior
Bureau of Land Management

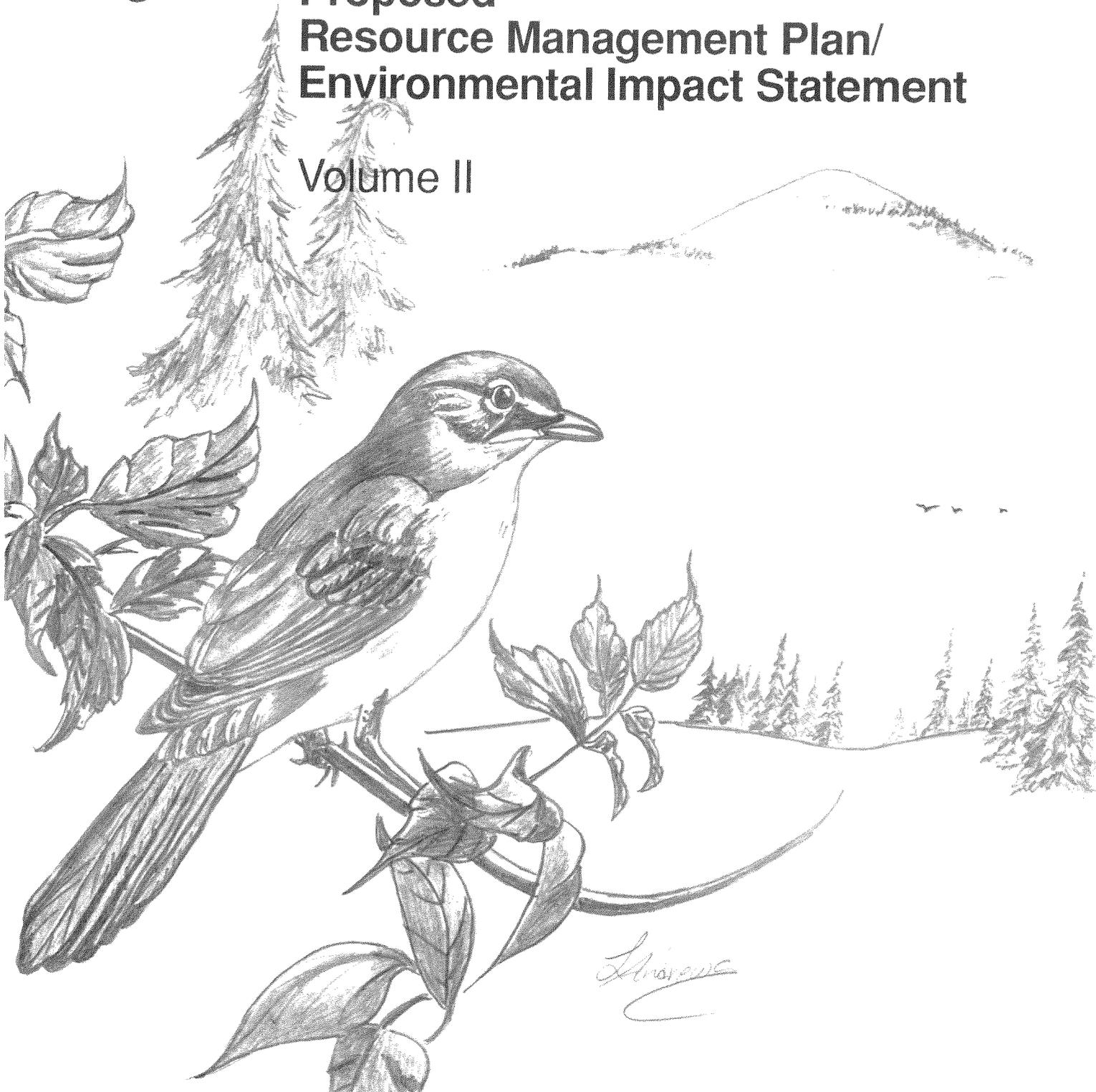
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Roseburg District Proposed Resource Management Plan/ Environmental Impact Statement

Volume II



Anderson

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interest of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

BLM/OR/WA/ES-94/34+1792

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Appendix A

Legal Guidelines

The following statutes and executive orders (as amended) constitute the major legal guidance for planning and management of lands administered by BLM in western Oregon. This list is not necessarily all inclusive but does represent the primary legal guidance to be considered in preparation of the Resource Management Plan.

Federal Land Policy and Management Act of 1976 (FLPMA)	43 USC 1701
The O&C Sustained Yield Act of 1937	43 USC 1181a
National Environmental Policy Act of 1969 (NEPA)	42 USC 4321
Environmental Quality Improvement Act of 1970	42 USC 4371
Executive Order 11514, Protection and Enhancement of Environmental Quality (1970)	
Taylor Grazing Act	43 USC 315
Recreation and Public Purposes Act	43 USC 869
Unlawful Inclosures or Occupancy Act	43 USC 1061
Mining and Minerals Policy Act of 1970	30 USC 21a
Mining Act of 1872	30 USC 26
Mineral Leasing Act of 1920 (Mineral Lands Leasing Act)	30 USC 181
Materials Act of 1947	30 USC 601
Geothermal Steam Act of 1970	30 USC 1001
Geothermal Energy Act of 1980	30 USC 1501
Antiquities Act of 1906	16 USC 431
Historic Sites, Buildings, and Antiquities Act	16 USC 461
National Historic Preservation Act	16 USC 470
Archaeological Resources Protection Act of 1979	16 USC 470aa
Reservoir Salvage Act of 1960	16 USC 580m-n
Fish and Wildlife Coordination Act	16 USC 661
Bald Eagle Protection Act	16 USC 668
Sikes Act	16 USC 670a
Migratory Bird Treaty Act	16 USC 703
Migratory Bird Conservation Act	16 USC 715
Wilderness Act	16 USC 1131
National Trail Systems Act	16 USC 1241
Wild and Scenic Rivers Act	16 USC 1271
Executive Order 11644, Use of Off-Road Vehicles on the Public Lands (1972)	
Executive Order 11989, Off-Road Vehicles on Public Lands (1977)	
Wild Free-Roaming Horses and Burros Act	16 USC 1331
Coastal Zone Management Act of 1972	16 USC 1451
Endangered Species Act of 1973	16 USC 1531
Soil and Water Resources Conservation Act of 1977	16 USC 2001
Executive Order 11988, Floodplain Management (1977)	
Executive Order 11990, Protection of Wetlands (1977)	
Coastal Barriers Resources Act	16 USC 3501
Land and Water Conservation Fund Act of 1965	16 USC 4601-4
Federal Water Pollution Control Act/Clean Water Act	33 USC 1251
Safe Drinking Water Act	42 USC 300 (f)
American Indian Religious Freedom Act	42 USC 1996
Resource Conservation and Recovery Act of 1976	42 USC 6901
Clean Air Act	42 USC 7401
Comprehensive Environmental Response, Compensation and Liability Act of 1980	42 USC 9601
Emergency Planning and Community Right-to-Know Act of 1986	42 USC 11001

Appendix B

State Director Guidance for the RMP Process

According to Bureau regulations for preparing RMPs, “the State Director shall provide quality control and supervisory review, including plan approval, for plans and related environmental impact statements and shall provide additional guidance, as necessary, for use by District and Area Managers.” “Guidance” means “any type of written communications or instructions that transmits objectives, goals, constraints or any other direction that helps District and Area Managers and staff know how to prepare a specific resource management plan.”

Early in the process of concurrently preparing this RMP and five other RMPs which together cover all BLM-administered lands in western Oregon, the BLM State Director decided to develop comprehensive procedural guidance as planning criteria to assure consistent treatment of a variety of issues and concerns in the six plans. The intent to do this was conveyed to known interested parties in a mailer sent out by each BLM district office with planning responsibility on March 27, 1987. Suggestions for content of that guidance were solicited in the mailer.

There was limited public response, but that response, along with internal BLM recommendations, led to formulation of a proposed set of topics for State Director guidance. A mailer describing those topics were sent to the public for comment on August 11, 1987. Using further but still limited public comments, BLM modified its list of topics slightly and drafted Proposed State Director Guidance, which was sent out for public review by interested parties on May 13, 1988.

Although less than a hundred individuals and groups responded, many of the comments received were thoughtful and constructive, and addressed the proposals in depth. BLM undertook a substantial revision of many sections of the proposed guidance. This revision was done on a staggered schedule, to distribute the workload and provide timely guidance to the districts for each step in the process.

The first element of the guidance completed was Guidance for the Preparation of the Analysis of the Management Situation (AMS). This document summarizes important information about existing resource conditions, uses and demands, as well as about management activities and natural relationships. It provides the baseline for subsequent steps in the planning process, such as the design of alternatives and analysis of environmental consequences. The AMS also provides most of the data to be summarized in the “affected environment” chapter of the EIS. The AMS guidance prescribed minimum contents and table formats for the AMS for each plan. That guidance was essentially completed in October 1988, and slightly revised during 1989 and 1990.

A master glossary for the AMS was prepared as part of the State Director Guidance. It was completed in 1989, and later revised for inclusion in each Draft RMP.

The Guidance for Formulation of Alternatives was essentially completed in October 1990 but underwent modest revision during 1991 and 1992. A copy of the final version of this guidance is included in this appendix.

Two other sections, Guidance for Analytical Techniques Needed to Estimate Effects of Alternatives and Guidance for Use of the Completed Plan, were completed in July 1991, with slight modification of the former in 1992. Descriptions of complex analytical techniques have been appendicized to discussions of the relevant analyses in Chapters 3 and 4. The Use of the Completed Plan section was wrapped into the equivalent section of Chapter 2 of the Draft RMP/EIS.

The original draft guidance had two other sections that never became final. Guidance for the Executive Summary was dropped because the State Director’s staff prepared that summary. Guidance for expressing consistency with plans, programs and policies of other agencies was never formalized, as BLM staff worked with state agencies and county planners until the Draft RMP/EISs were almost complete, on ways to express such consistency.

Guidance for Formulation of Alternatives

Introduction

The purpose of alternatives is to identify a range of reasonable combinations of resource uses and management practices that respond to planning issues and provide management direction for all resources. Five common alternatives will be addressed in each RMP, to provide a consistent set of distinct choices among potential management strategies.

A no change from the existing land use plan alternative will also be addressed. This is the "no action" alternative. In the other alternatives all existing land use decisions not found valid for continued implementation after 1990 (through an analysis summarized in the Analysis of the Management Situation), will be reconsidered.

Common alternatives that identify specific management actions along District boundaries will be consistent. Examples include elk management areas, spotted owl corridors or visual corridors.

This Guidance for Formulation of Alternatives may be modified later based on information identified in the districts' analyses of the management situation, or refinements that flow from the districts' site-specific development of common alternatives.

Goals and Objectives of the Common Alternatives

The purpose of the goal and objective statements for the five common alternatives (A through E) is to guide development of specific criteria. Each alternative, if implemented, is intended to achieve or meet its goal. Goal and objective statements focus on general direction of alternatives rather than technical points in issue-related criteria for the alternatives. In each alternative all resource management values would be accommodated to the extent consistent with the primary goals and objectives for that alternative.

Specific Guidance on Common Alternatives

The common alternatives would differ primarily in the way they allocate primary uses of lands (for example, lands allocated to intensive forest management, and lands allocated to protection of riparian zones).

The discussion on page 4 through part of pages 14 and 15 describes criteria for addressing each of the eleven planning issues in the formulation of the common alternatives. It also describes how land use allocations and management actions would vary in response to each issue. Within the specific constraints provided by the guidance for addressing each issue, the districts have flexibility to formulate the common alternatives as they consider appropriate to meet the goals and objectives of each alternative.

	Alternative A	Alternative B
GOALS:	Emphasize high production of timber and other economically important values on all lands to contribute to community stability.	Emphasize timber production to contribute to community stability consistent with the variety of other land uses such as fish and wildlife habitat, recreation, and scenic resources on O&C and CBWR lands. Give equal consideration to all resource values on public domain lands.
OBJECTIVES:	<ul style="list-style-type: none"> • Produce the highest sustained yield of timber on all suitable forest lands legally available for harvest. • Contribute to ecological functions important to timber productivity and to habitat diversity to the extent possible consistent with the allocation for timber production. • Manage threatened and endangered species habitat as legally required. • Provide Research Natural Areas and eligible Areas of Critical Environmental Concern to the extent consistent with the allocation for timber production. • Manage appropriate Congressionally designated areas to maintain and enhance their scenic values. • Meet legal requirements for protection of wetlands and water quality, to protect anadromous fish habitat and other relevant values. • Emphasize substantial developed and dispersed motorized recreation uses. • Find no additional rivers suitable for designation under the Wild and Scenic Rivers Act. • Make land tenure adjustments which enhance BLM long-term sustained yield timber harvest opportunities. • Provide no special management in rural (residential) interface areas. 	<ul style="list-style-type: none"> • Produce a high sustained yield of timber on O&C and CBWR lands, and on public domain lands where nontimber uses and values are of lesser importance than timber production. • Contribute to ecological functions important to timber productivity and to habitat diversity using a system that maintains old growth and mature forest in large and small blocks. • Protect habitat of all threatened and endangered species and species with high potential for listing. Protect habitat of other species of substantial concern to the extent consistent with high timber production. • Retain existing Research Natural Areas (RNAs) and Areas of Critical Environmental Concern (ACECs). Provide new ones from eligible areas to the extent consistent with the emphasis on timber production. • Manage scenic resources in selected areas of high recreation use. • Meet legal requirements for protection of wetlands and water quality and provide moderate additional protection for anadromous fish habitat, other substantial streams, and other water. • Provide for a wide range of developed and dispersed motorized recreation uses and opportunities, to minimize conflicts among recreation user groups. • Find eligible river segments suitable for designation as recreational, if they are important and manageable, and designation would not cause adverse economic impact. • Make land tenure adjustments which enhance BLM long-term sustained yield timber harvest opportunities on O&C and CBWR lands, and which benefit a variety of uses and values on public domain lands. • Adopt appropriate special forest management practices on BLM-administered lands intermingled with or adjacent to rural interface areas zoned for most dense residential occupancy.

Alternative C

Provide timber production to contribute to community stability consistent with maintenance of biological diversity and the variety of other uses such as fish and wildlife habitat, recreation, and scenic resources on all lands.

- Produce a moderate sustained yield of timber.
- Provide biological diversity using a system that maintains some old growth and mature forest, focusing on protection of areas where special status plant and animal species cluster.
- Protect habitat of all threatened and endangered species and species with high potential for listing. Protect habitat of other species of substantial concern through emphasis on biological diversity and to the extent consistent with moderate timber production.
- Retain existing RNAs and ACECs. Provide new ones from eligible areas except where lands managed by others are considered to provide more appropriate opportunities.
- Manage scenic resources in selected high use areas, particularly emphasizing protection in corridors of existing and proposed wild and scenic rivers and major trails.
- Provide substantial protection for anadromous fish habitat, other substantial streams and other water environments.
- Provide for a wide range of recreation opportunities emphasizing dispersed use, while reducing conflicts among recreational user groups.
- Find eligible river segments suitable for designation as scenic or recreational, if they are important and manageable, but not suitable for designation as scenic if designation would cause adverse economic impact.
- Make land tenure adjustments to benefit a variety of uses and values.
- Adopt appropriate special forest management practices in rural interface areas zoned for moderate or high density residential occupancy.

Alternative D

Emphasize protection and reestablishment of spotted owl habitat, along with management and enhancement of other values such as dispersed nonmotorized recreation opportunities and scenic resources, while sustaining some timber production.

- Produce a sustained yield of timber consistent with allocations for other uses and values.
- Protect habitat of the spotted owl in accordance with the Owl Conservation Strategy.
- Protect habitat of all threatened and endangered species, species with high potential for listing, and species of related concern.
- Retain all existing RNAs and ACECs. Provide new ones from eligible areas except where lands managed by others are considered to provide more appropriate opportunities.
- Manage all identified scenic resources.
- Provide substantial protection for wetlands and riparian areas along most streams and other water.
- Emphasize dispersed nonmotorized recreation opportunities.
- Find eligible river segments suitable for designation as wild, scenic or recreational, if they are important and manageable.
- Make land tenure adjustments which would emphasize enhancement of nontimber uses and values.
- Adopt special timber harvest and forest management practices in rural interface areas zoned for moderate or high density residential occupancy.

Alternative E

Emphasize protection of older forests and management and enhancement of values such as dispersed nonmotorized recreation opportunities and scenic resources.

- Produce a sustained yield of timber consistent with allocations for other uses and values.
- Protect all old growth and older mature forests.
- Protect habitat of all threatened and endangered species, species with high potential for listing and species of related concern.
- Retain all existing RNAs and ACECs and designate all eligible areas.
- Manage all identified scenic resources and provide some visual resource protection for all lands.
- Manage all riparian areas and wetlands to maintain and improve water quality and fisheries habitat, and contribute to wildlife habitat diversity.
- Emphasize dispersed nonmotorized outdoor recreation opportunities.
- Find all eligible river segments suitable for designation as wild, scenic or recreational rivers.
- Make land tenure adjustments which would emphasize enhancement of nontimber uses and values.
- Adopt special timber harvest and forest management practices extensively buffering rural interface areas zoned for moderate or high density residential occupancy and other rural interface areas as appropriate.

All Common Alternatives

Alternative A

Issue No. 1: Timber Production Practices: Which forest lands should be available for timber management, and what practices should be used on those lands?

Guidance for All Common Alternatives: Lands allocated to intensive forest management under any of these alternatives would normally provide the highest nondeclining harvest level (even flow) of timber when the following conditions prevail:

- Effective silvicultural techniques (such as clear cutting, shelterwood or partial cutting) appropriate to the land allocations are used.
- All feasible site preparation and intensive management practices are applied.
- Anticipated merchantability is the only constraint on minimum average stand diameter slated for future harvest. (In some areas this may result in harvest of timber stands as young as 40 years for several decades during the early to middle part of the next century under some alternatives.)
- Adequate budgets are available to support the resultant timber sale program and allied intensive management practices, as well as scheduled monitoring linked to those activities.

The common alternatives assume these practices and conditions on the lands allocated to intensive timber management, but incorporate less intensive management practices on other available forest lands to the extent needed to be consistent with the allocation of those lands.

Where consistent with the goals and objectives of each alternative, the following silvicultural and harvest practices would be implemented on lands allocated primarily to timber management, to meet multiple land use objectives:

Minimize regeneration delay by reforesting harvested sites as soon as practical. Calculate an empirical regeneration period based on representative stocking survey results, expected timber sale contract lengths and management objectives.

Reforest harvested lands with indigenous commercial tree species. Emphasis would be placed on utilization of genetically improved stock in accordance with the Western Oregon Tree Improvement plan.

Manage tree seed orchards to produce adequate supplies of genetically improved seed.

Use available site preparation and seedling protection practices, including herbicides, using an integrated vegetation management approach. Emphasize those techniques that have proved most effective in assuring seedling survival and growth. (Actual practices will be based on site-specific analysis following completion of the RMP.)

Convert to conifers those lands classified as commercial forest lands presently occupied by grass, hardwoods and brush.

Allocate all forest lands for timber production consistent with the management direction for other resources (Issue Nos. 2 and 3, etc.) in this alternative, except the following:

Nonsuitable Woodland (See Figure 1-E-1 for Chart showing TPCC categories.)

Alternative B

Alternative C

Alternative D

Alternative E

Allocate all forest lands for timber production consistent with the management direction for other resources in this alternative, except the following:

Nonsuitable Woodland
Suitable Woodland - Low Site

Allocate all forest lands for timber production consistent with the management direction for other resources, except the following:

Nonsuitable Woodland
Suitable Woodland - Low Site
Suitable Woodland -
Nonsuitable Commercial
Forest Land

Allocate all forest lands for timber production consistent with the management direction for other resources, except the following:

Nonsuitable Woodland
Suitable Woodland - All
Categories

Allocate all forest lands for timber production consistent with the management direction for other resources, except the following:

Nonsuitable Woodland
Suitable Woodland - All
Categories
The Fragile Gradient-Restricted
component of the Fragile
Suitable TPCC category
Site Class V

All Common Alternatives

Alternative A

Issue No. 1 (Continued)

Plan hardwood sites for management of a sustained yield of hardwoods, where consistent with allocations for other uses or values.

Implement commercial thinning of present and future stands where practicable and where research indicates increased gains in timber production are likely.

Practice initial spacing control of seedlings/saplings through planting or thinning in conjunction with the control of competing vegetation, to maximize wood production by concentrating site resources in individual tree growth.

Plan nitrogen fertilization applications for all present and future stands where research indicates increased wood yields would result.

Plant specific root disease centers with resistant tree species.

Consider uneven-age management in stands where this method would be economically feasible and would maintain environmental values.

Consider efficiency of field operations and assurance of prompt reforestation in selecting the size of timber harvest units.

Apply proper soil management measures to maintain soil productivity.

Issue Nos. 2 and 3: Old-Growth Forests and Habitat Diversity

To what extent and where should old-growth and/or mature forest habitats be retained, maintained or reestablished to meet various resource objectives? To what extent and where should BLM manage habitat to support populations of native wildlife species?

Any wildlife habitat management practice (such as nest boxes, road closures and forage seeding) not listed in the following could be implemented under any of the alternatives, as long as it is compatible with other management objectives. All special habitat features would be managed to protect their values. Mature and old-growth forests would be retained where Congressional designation of areas requires it. Snags and/or wildlife trees (to be converted to snags) would be retained where they occur on lands not allocated to timber harvest, except where public safety is a concern, and if left standing as nonmerchantable material on available forest lands. Where it would contribute to meeting wildlife tree objectives, create snags in areas not allocated primarily to timber production. A habitat goal of timber sale contracts would be to leave all snags and nonmerchantable trees that can be left consistent with safety considerations.

Mature and old-growth forests would be retained on most lands excluded from planned timber harvest by inclusion in the following allocations and TPCC categories:

Nonsuitable Woodland
Riparian Management Areas
Existing high-use recreation sites
T&E species recovery areas where timber harvest is prohibited
Wilderness Areas

Alternative B

Alternative C

Alternative D

Alternative E

Contribute to habitat diversity using a system that protects mature and old-growth forest in large and small blocks. Mature and old-growth components of the forest would be distributed in a corridor system by seed zone and elevation. In the corridor system large blocks of approximately 640 acres would be connected by a series of small, stepping stone blocks of approximately 80 acres, spaced at about one-mile intervals. Blocks would be limited to defined corridor areas.

Public Domain lands and the following allocations and TPCC categories on O&C and CBWR would receive priority for placement into the system, to the extent that they fit; for instance, if they provide needed habitat and are suitably located to contribute to the system.

Nonsuitable Woodland
 Suitable Woodland - Low Site
 Riparian Management Areas
 Recreation Sites
 T&E species recovery areas where timber harvest is prohibited
 Special Areas (Natural Areas, ACECs)
 Wildmess Areas

This alternative would provide for retention and improvement of biological diversity. Blocks of forest land at least 600 acres in size and, where relevant opportunities exist, at least 2500 acres in size (including cornering tracts) would be identified as old-growth restoration and retention areas, totalling 15 to 20 percent of BLM-administered forest land. Identification of these areas would focus on protection of older forest stands, connectivity between larger reserves and subregions, and protection of identified areas where special status plant and animal species cluster.

The remaining BLM-administered forest lands, not excluded from timber harvest to address other issues, would be subject to intermediate harvests for density management where feasible, to maintain open canopy conditions and promote retention of mixed species, as well as accelerate development of old-growth structure conditions and prepare the stands for regeneration

This alternative would manage habitats on BLM-administered lands to provide for a number and distribution of spotted owls that ensures continued existence of a well distributed population on those lands, so they may interact with spotted owls throughout the geographic range of the species, as recommended by the Conservation Strategy for the Northern Spotted Owl.

Suitable wildlife trees would be retained to contribute to the maintenance or attainment of cavity-dweller populations on BLM-administered lands at 60 percent of the optimum woodpecker population level. Wildlife tree and down log management practices would be used on the available forest lands, including but not limited to retention of green culls, snags and down logs. All special habitat features would be appropriately buffered.

This alternative would preserve the following:

- all existing forest stands over 150 years old.
- additional lands within 400 feet of the above stands, to assist in maintaining natural ecological elements, protect the older stands from edge effect and natural disaster, and interconnect them into a sustainable network.
- all suitable habitat forest stands which most closely match the lands within two miles of each spotted owl site occupied by a single or pair of owls in the last six years (1985-1990). In addition protect younger forest where needed to provide contiguous habitat within a mile of those sites.
- in each section where BLM administers at least half of the land, a 40-acre block of the oldest stands remaining, concentrated around headwaters streams, to provide habitat for amphibians and nesting for pileated woodpeckers.

All Common Alternatives

Alternative A

Issue Nos. 2 and 3 (Continued)

Issue No. 4: Threatened and Endangered (and Other Special Status) Species Habitat

What should BLM do to manage Federally listed threatened or endangered plants and animals and to prevent future Federal listing of plants and animals as threatened or endangered species?

Protect, monitor and manage habitats of Federal listed and proposed species in accordance with the Endangered Species Act and recovery plans, as legally required for self-sustaining survival.

Timber production constraints would be assumed in the formulation of the alternative only if critical habitat has been designated or there is a recovery or conservation plan within a month after completion of the Analysis of the Management Situation. Manage for the conservation of, and mitigate actions to protect habitats of, Federal Candidate, State Listed and Bureau Sensitive species where such actions would not diminish commercial use such as timber production.

Issue No. 5: Special Areas

What areas on BLM-administered lands need special management to prevent irreparable damage to important historic, cultural or scenic values; to protect botanical or fish and wildlife resources or other natural systems or processes; and to protect life and safety from natural hazards? Which of these areas should be formally designated as Areas of Critical Environmental Concern (ACEC)?

Any areas considered appropriate for Research Natural Area (RNA) designation would also be considered appropriate for ACEC designation.

Designate potential ACECs that meet criteria only if the relevant values are not protected by other authorities (e.g., Wild River designation, the Endangered Species Act). Existing ACECs and potential ACECs that meet the preceding standard, including RNAs and proposed RNAs, would be retained or designated on nonforest lands or unsuitable woodlands of no substantial mineral potential. Other existing ACECs and RNAs would be revoked.

Alternative B

Alternative C

Alternative D

Alternative E

Suitable wildlife trees and/or snags would be retained to maintain, where possible, cavity-dweller populations at 40 percent of the optimum woodpecker population levels in new timber harvest units. Wildlife tree management practices would be used on the available forest lands, including retention only of green culls and snags.

harvest in the future. Regeneration harvests on these lands would be either heavy partial cuts (green-tree retention) or group selection cuts, and would not occur until after a stand had established old-growth characteristics.

The lands in old-growth restoration and retention areas, which have not attained old-growth characteristics, would be subject to similar density management, where feasible, until they attain such a condition.

Suitable wildlife trees would be retained to contribute to the maintenance or attainment of cavity-dweller populations on BLM administered lands at 60 percent of the optimum woodpecker population level. Wildlife tree and down log management practices would be used on the available forest lands, including but not limited to retention of green culls, snags and down logs. All special habitat features would be appropriately buffered.

In addition to retention of wildlife trees on lands not allocated to timber management, suitable wildlife trees would be retained to contribute to the maintenance of cavity-nester populations at 60 percent of the maximum potential population level on lands allocated to timber management. Wildlife tree and down log management practices would be used on the available forest lands, including but not limited to retention of green culls, snags and down logs. All special habitats would be appropriately buffered.

Same as Alternative A, except protect habitats of Federal Candidate, State Listed and Bureau Sensitive Species to the full extent on public domain land, and protect habitats of Federal Candidate (i.e., Category 1 and 2) species known only to occur on BLM-administered lands to the extent considered necessary to prevent their federal listing.

Same as Alternative B except for additional protection of special status species provided by criteria for Issues 2 and 3.

Manage all BLM-administered lands to support the conservation and protection of all Federal Candidate, State Listed, and Bureau Sensitive species and their habitats.

Same as Alternative D.

Retain all existing ACECs and RNAs. Designate potential ACECs that meet criteria only if the relevant values are not protected by other authorities. Do not allocate new RNAs on available O&C or CBWR land if a similar feature can be protected on a National Forest. Designate all potential ACECs (including RNAs) on Public Domain lands, nonforest lands, nonsuitable woodlands, and other lands allocated to nontimber uses.

Retain all existing ACECs and RNAs. Designate potential ACECs that meet criteria only if the relevant values are not protected by other authorities.

Retain all existing and designate all potential ACECs.

Same as Alternative D.

All Common Alternatives

Alternative A

Issue No. 6: Visual Resources

Which, if any, areas of BLM lands should be managed to reduce visual impacts or enhance visual (scenic) quality?

Note: Guidance for Issue 11 (Rural Interface Area Management) also addresses and defines visual resource management for Alternatives B, C, D and E in rural interface areas, except where this Issue 6 guidance sets a higher standard of visual resource management. Guidance for Issue 9A (Wild and Scenic Rivers) establishes criteria that will substantially dictate visual resource management by alternative in proposed wild and scenic river corridors. See Issue 9A and Issue 11 guidance for details.

Provide VRM Class I management within existing boundaries designated by Congress for exclusive management. Manage all other available (for timber harvest) forest land under VRM Class IV management objectives. Manage other lands as inventoried.

Provide VRM Class I management within

Issue Nos. 7 and 8: Stream/Riparian/Water Quality

Where and how should riparian zones be managed to protect and improve water quality, fisheries and wildlife habitat? What actions should be undertaken to comply with state water quality standards? What should BLM do to manage for special needs such as municipal and domestic use?

Guidance for All Common Alternatives: Establish Riparian Management Areas (RMAs) on perennial streams (generally, 3rd order and larger streams), lakes, ponds and other waters, to meet Oregon Forest Practices Act requirements and Oregon water quality standards. Typical average widths of RMAs by alternative are displayed in Table 1. Within those RMAs no lands would be considered "available" (to offer timber for sale as part of the allowable sale quantity). Some timber harvest may occur, however, to achieve resource management objectives. These activities may include road construction and yarding corridors across streams and riparian zones to facilitate timber harvest outside the RMA.

Logging, road building and site preparation methods would be designed to minimize the number and/or size of mass soil movements and to maintain the integrity of the RMAs. Other activities such as mining, recreation and ORV use would be regulated to protect water quality. Stream and riparian habitat improvement measures may be taken on any streams to improve water quality, fish habitat and/or wildlife habitat. Activities would be designed to meet Oregon Forest Practices Act (OFPA) requirements and Oregon water quality standards.

Protect wetlands in accordance with Executive Order 11988 and 11990.

Comply with written agreements with public water systems serving municipalities.

Issue No. 9: Recreation Resources

What areas or sites should be designed and/or managed to protect or enhance a variety of recreational opportunities?

Manage for dispersed recreation activities consistent with managed forest settings, including hunting, fishing, sightseeing, riding/hiking, and rafting. Maintain and manage existing recreation facilities which make available significant dispersed recreation opportunities, including recreation sites, boat ramps, trails, interpretive signs and related improvements. Manage existing Special Recreation Management Areas (SRMAs) and delineate Extensive Recreation Management Areas (ERMAs).

Manage existing high-use recreation sites and trails and expand them where needed. Close low use recreation sites and trails. Designate lands open to off-road vehicles (ORV) and leave roads open to motorized use, except where such designation would conflict with other allocations.

Alternative B

existing boundaries designated by Congress for exclusive management. Manage as inventoried all available forest land adjacent to (within a quarter mile) developed recreation sites, state and federal highways, state scenic waterways, and rivers designated under the federal Wild and Scenic Rivers Act. Manage all other available forest land under VRM Class IV management objectives. Manage other lands as inventoried.

Alternative C

Same as Alternative B, except on available forest land where BLM-administered land makes up more than half of a viewshed, manage lands as inventoried.

Alternative D

Manage all lands as inventoried.

Alternative E

Same as Alternative D, except manage as VRM Class III all BLM-administered lands inventoried as Class IV; and manage as VRM Class I BLM-administered lands adjacent to (within a quarter mile) developed recreation sites, state and federal highways, state scenic waterways and rivers designated under the federal Wild and Scenic Rivers act.

Table 3-1. Riparian Management Areas

Stream Order	Average RMA Width* (each side of the stream in feet)				
	ALT. A	ALT. B	ALT. C	ALT. D	ALT. E
1					50
2				60	60
3	75	75	105	140	200
4	75	100	150	200	200
5	75	140	210	280	280
6	75	160	240	320	320
Lakes, Ponds & Other Waters	75	100	150	200	400

* Actual RMA widths would be determined by on-the-ground riparian vegetation, terrain and stream characteristics, but would be a minimum of 50 feet on all 3rd order and larger streams. First and second order streams would have RMAs designated if perennial or if the beneficial uses warrant.

Same as Alternative A, except support the State's Regional Economic Development Plan for the geographic area, retain options for new SRMAs and high value potential recreation sites and trails on Public Domain lands, maintain and/or improve all existing developed recreation sites, and consider reopening sites closed in recent years.

Allocate and manage new SRMAs. Continue management of all existing recreation sites and trails, and consider reopening sites closed in recent years. Emphasize wildlife viewing, interpretation and related old-growth forest recreation opportunities, both to attract nonlocal visitors and to serve local users. Retain options for future development of high value potential sites, trails and sightseeing opportunities. Impose additional ORV limitations or road closures to protect wildlife habitat or old-growth forest recreation opportunities, minimize conflicts with hikers and horseback riders, or meet other resource objectives.

Same as Alternative C, except manage for an optimum range of nonmotorized recreation. Retain options for future development of recreation sites and facilities for dispersed recreation opportunities. Retain existing pockets of old-growth forest that are both adjacent to and accessible from existing or potential recreation areas. Prohibit ORV and road use as appropriate to improve wildlife habitat or protect the ecosystem.

Same as Alternative D.

All Common Alternatives

Alternative A

Issue No. 9A: Wild and Scenic Rivers

What, if any, rivers should be found suitable for designation?

Provide interim protection for all river segments determined to be suitable, until Congressional action on BLM plan recommendations. Interim protection should be appropriate to the highest category for which the river is determined to be suitable. Manage Congressionally designated rivers consistent with their designation.

No rivers found suitable for designation under any classification.

Issue No. 10: Land Tenure

In what areas would BLM-administered lands be sold, exchanged or transferred out of federal ownership under other authorities to improve management efficiency and benefit resource program objectives? In what areas would BLM attempt to acquire lands to improve management efficiency and benefit resource program objectives?

A major lands program effort would use exchanges to consolidate land ownership patterns to benefit one or more of the resources managed, such as timber, watershed, wildlife habitat, recreation, cultural, botanical, and minerals.

Land tenure adjustment would be guided by a three-zone concept utilizing the following standards:

Zone 1 includes areas currently identified as having high public resource values, and other efficiently managed lands. The natural resource values may require protection by federal law, Executive Order or policy. These lands may have other values or natural systems which merit long term public ownership. They do not meet the criteria for sale under FLPMA Section 203(a) and would generally be retained in public ownership. The Zone 1 boundaries should be relatively close to or on BLM property lines except where the intent is to show preferred acquisition areas.

Zone 2 includes lands that are suitable for exchange because they form discontinuous ownership patterns, are less efficient to manage than Zone 1 lands, and may not be accessible to the general public. Where appropriate opportunities are identified, these BLM-administered lands may be exchanged for other lands in Zones 1 or 2, transferred to other public agencies, or given some form of cooperative management. These lands would not be expected to meet the criteria for sale under Section 203(a), and would not be identified as suitable for such sale.

Zone 3 includes lands that are scattered and isolated with no known unique natural resource values. Zone 3 lands are available for use in exchanges for private inholdings in Zone 1 (high priority) or Zone 2 (moderate priority). They are also potentially suitable for disposal through sale. Exchanges would be made to acquire lands which would enhance the nondeclining harvest level of the commercial forest land managed by BLM, by improving age class distribution or other harvest level determination factors. Factors to consider include site quality, access to public forest land, logical logging units, and management of public forest land to facilitate timber harvest. No exchanges would be made to acquire lands more valuable for nontimber uses. No commercial timberland would be sold or leased. Leases or conveyance of land in Zones 2 and 3 other than commercial timberland would be made under the Recreation and Public Purposes Act to provide appropriate facilities or services.

Alternative B

No rivers found suitable for designation as wild or scenic. River segments eligible for wild, scenic or recreational classification found suitable for designation as recreational, if all of the following circumstances exist:

- no net adverse economic impacts on the local economy.
- river segment possesses at least one outstandingly remarkable value for which it is considered by BLM to be the top river in the State Comprehensive Outdoor Recreation Plan (SCORP) region.
- BLM can effectively manage the outstanding values of the river segment.

Exchanges of O&C and CBWR lands would be made primarily to acquire lands which would enhance timber management opportunities. Exchanges of public domain lands would be made to benefit one or more of the resources managed, including nontimber values. Sale of O&C and CBWR lands other than available commercial forest lands, and of public domain lands, would be made to dispose of lands that meet any of the criteria of FLPMA Section 203(a). Leases on such lands would be made to accommodate other uses. Leases or conveyances under the Recreation and Public Purposes Act would be made in Zones 2 and 3 to provide appropriate facilities or services.

Alternative C

River segments eligible for scenic or recreational river status found suitable for designation consistent with their highest potential classification, and river segments eligible for wild classification found suitable for designation as scenic, if all of the following circumstances exist. If only the economic impact test is not met, find suitable for designation as recreational.

- no net adverse impacts on the local economy.
- river segment possesses at least one outstandingly remarkable value for which it is considered by BLM to be among the top two rivers in the SCORP region.
- BLM can effectively manage the outstanding values of the river segment.

Same as Alternative B, except emphasis would also be given to exchanges of O&C and CBWR lands that would contribute to conservation of biological diversity.

Alternative D

Eligible river segments found suitable for designation consistent with their highest potential classification if the following circumstances exist.

- river segment possesses at least one outstandingly remarkable value for which it is considered by BLM to be among the top four rivers in the SCORP region.
- BLM can effectively manage the outstanding values of the river segment.

Land exchanges would be made to benefit one or more of the resources managed. Exchanges involving disposal of timber to acquire lands containing greater nontimber values would be emphasized. Sales of lands other than available commercial forest lands would be made to dispose of lands that meet criteria (1) or (2) of FLPMA Section 203(a), but sales of land that meet only criterion (3) would not be made. No lands would be leased, except leases and conveyances under the Recreation and Public Purposes Act would be made in Zones 2 and 3 to provide facilities or services for the benefit of the public.

Alternative E

All eligible river segments found suitable for designation consistent with their highest potential classification.

Same as Alternative D.

All Common Alternatives

Alternative A

Issue No 10. (Continued).

under FLPMA Section 203(a) if important recreation, wildlife, watershed, threatened or endangered species habitat, and/or cultural values are not identified during disposal clearance reviews and no viable exchange proposals for them can be identified. The discussion of Zone 3 lands must state which of the disposal criteria in FLPMA, Section 203(a), apply. Zone 3 lands would also be available for transfer to another agency or to local governments, as needed to accommodate community expansion and other public purposes.

Issue No. 11: Rural Interface Area Management

Which BLM-administered lands should be allocated to receive special management practices due to the concerns of residents who live in close proximity? (Rural interface areas are areas where BLM-administered lands are adjacent to or intermingled with privately owned lands where county zoning has created or allows for creation of lots as small as 1 to 20 acres. In most rural interface areas concerns of the residents are related to forest management practices, visual quality and potential affects on domestic water sources and water supplies.)

No special management actions except those that address other issues.

Alternative B

Alternative C

Alternative D

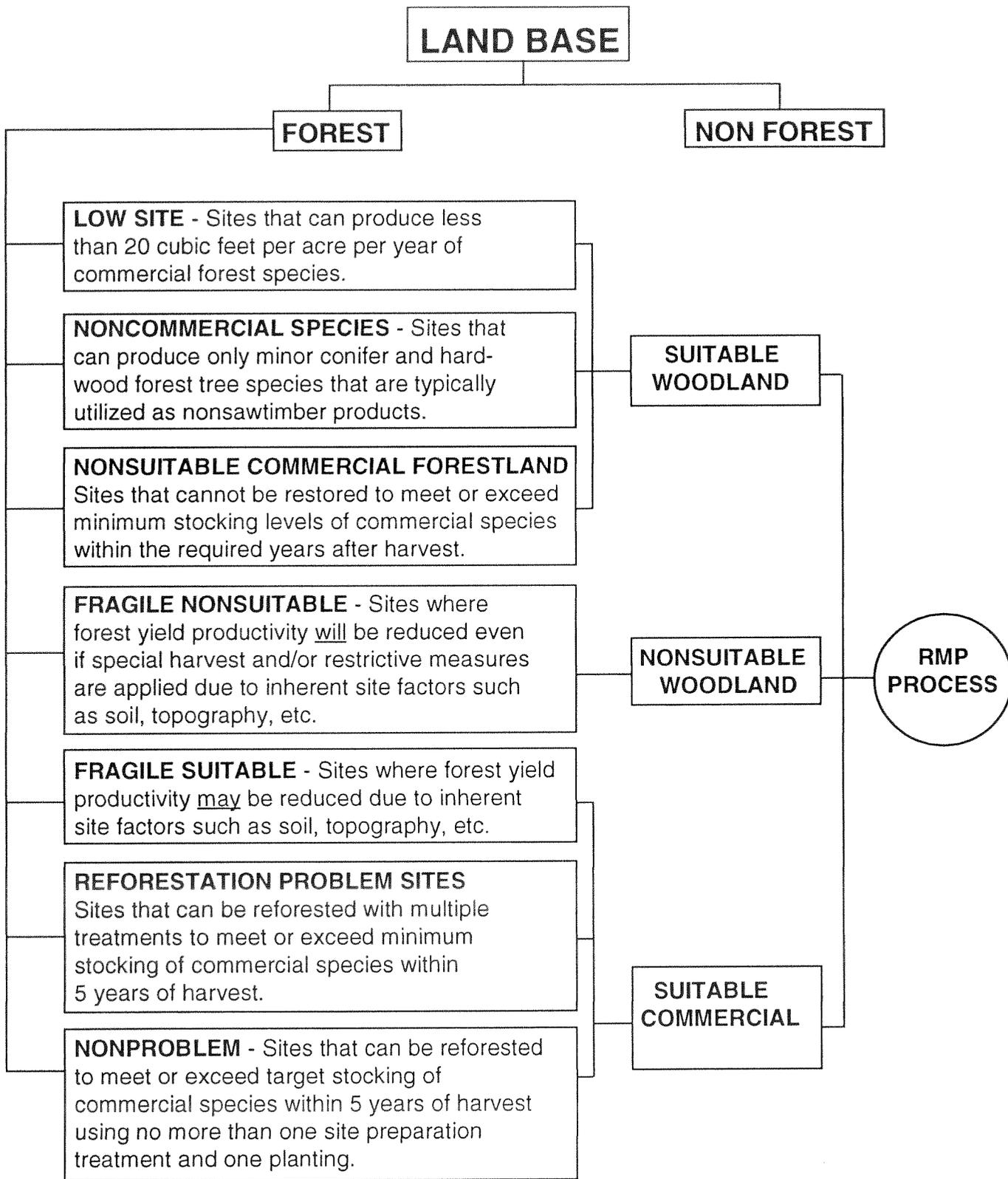
Alternative E

On BLM-administered lands within one quarter mile of private lands in identified rural interface areas zoned for 1 to 5-acre lots, customary forest management practices would be altered, where realistically feasible, to mitigate the adjacent neighbors' concerns (i.e., management would look for alternative methods of practicing intensive forest management). Examples of management options include harvest regimes other than clearcutting, hand application rather than aerial application of herbicides and pesticides, inclusion of additional buffers for domestic water sources, and hand piling slash for burning as opposed to broadcast burning. All BLM-administered lands within a quarter mile of designated rural interface areas 1 to 5-acre lots) would be managed for VRM class III objectives.

Same as Alternative B except that lands zoned for 1 to 20-acre lots would also be included as the rural interface area.

On BLM-administered lands within one quarter mile of private lands in rural interface areas zoned for 1 to 20-acre lots, there would be no herbicide spraying, no clear cutting, and no prescribed burning. BLM-administered lands within this area would be managed for VRM class II objectives.

Same as Alternative D except BLM-administered lands within one half mile of private lands in rural interface areas would be managed as discussed in Alternative D. Areas zoned for lots larger than 20 acres, but with tax lots of 20 acres or less and/or existing legal multiple residences, may also be addressed in this alternative.



Sensitivity Analyses

Sensitivity analysis is a process of examining specific opportunity costs and trade-offs which would result from making changes in single sensitive elements of an alternative. Such analyses are helpful in developing the preferred alternative, to make it most effective in reconciling potential conflicts and optimizing overall benefits. The sensitivity analysis will have the further benefit of informing the public about certain trade-offs, which should facilitate their offering informed preferences in their comments on the Draft RMP/EIS.

Because of the number of issues, concerns and alternatives, sensitivity analysis must be tightly focused to be manageable. The analysis, therefore, will focus on mid-range common alternatives and the preferred alternative.

At a minimum, the following will be analyzed for effects on timber harvest (ASQ) and related jobs and county revenues, and on other relevant resources or values:

1. For alternatives B, C and D, effects of substituting the next higher and next lower common alternative levels of riparian zone protection, and of providing only legally required (Alternative A) protection of riparian zones to preserve commercial trees on suitable forest or woodland. For the preferred alternative, the effects of substituting the alternative A and E levels.
2. For Alternative B, the effects of allocating no lands specifically for maintenance of older forest stands; or of managing the lands allocated for such protection on 250-year or longer rotation, with explicit provision for replacement; or of managing the lands allocated for timber production on 150-year rotation.
3. For Alternatives B and C, the effects of managing all lands allocated for timber production entirely under either of alternative C's partial retention approaches.
4. For Alternative C, the effects of managing the lands allocated for timber production entirely for 15 to 20 percent partial retention, but in the first decades not harvesting in the oldest 20 percent of them.
5. For Alternatives B and D, the effects of substituting the USF&WS proposed spotted owl recovery plan for each alternative's older forest or spotted

owl protection approach. For the preferred alternative, to provide a similar analysis, the effects of substituting the 50-11-40 rule for provision of connectivity by special management in Connectivity Areas.

6. For Alternative C, the effects of allocating the restoration and retention blocks to 35+ percent partial retention management, or of accelerating density management in those blocks in the first decade to the extent practical.
7. For Alternative D, the effects of a minimum harvest age constraint of 60 years (vis-a-vis 40 years in D in many plans).
8. For the preferred alternative:
 - The effects of precluding all timber harvest in old growth ecosystem areas.
 - No regeneration harvest of stands younger than cumulation of mean annual increment.
 - No constraint on minimum age of stands subject to regeneration harvest in General Forest Management Areas.
 - Foregoing planting genetically selected stock, vegetation management for release and precommercial thinning, fertilization, and stand conversion. To be analyzed for each practice individually and for all combined.

Other sensitivity analysis elements or increments may be added as deemed appropriate by a district.

Estimated effects on ASQ, together with resulting local employment and county revenues for each analysis, will be quantified. Effects on other resource attributes will be quantified only where available analytical techniques are readily applicable. Otherwise, effects will be compared to relevant environmental consequence conclusions for the basic plan alternatives.

Appendix C

Land Ownership Adjustment Criteria

In accordance with Federal Land Policy Management Act and other laws, Executive Orders, and Departmental and Bureau policy, the following criteria will be used to evaluate opportunities for disposal or acquisition. This list is not considered all inclusive, but represents the major factors to be evaluated. They include:

- Threatened or Endangered or sensitive plant and animal species habitat.
- Riparian areas and wetlands.
- Fish habitat.
- Nesting/breeding habitat for game and nongame animals.
- Key big game seasonal habitat.
- Developed recreation sites and recreation use areas.
- High quality scenery.
- Energy and mineral potential.
- Land adjacent to rivers eligible for designation under the National Wild and Scenic Rivers Act.
- Significant cultural resources and sites eligible for inclusion on the National Register of Historic Places.
- Designated wilderness areas and areas being studied for possible wilderness designation.
- Accessibility of the land for public recreation and other uses.
- Amount of public investments in facilities or improvements and the potential for recovering those investments.
- Difficulty or cost of administration (manageability).
- Suitability of the land for management by another Federal agency.
- Significance of the decision in stabilizing business, social and economic conditions, and/or lifestyles.
- Whether private sites exist for the proposed use.
- Encumbrances, including but not limited to, withdrawals or existing leases or permits.
- Consistency with cooperative agreements and plans or policies of other agencies.
- Suitability (need to change in land ownership or use) for purposes including but not limited to community expansion or economic development, such as industrial, residential, or agricultural (other than grazing) development.

Appendix D

Land Tenure Zone 3 Lands

The following lands meet the criteria for Zone 3 lands as described in Chapter 2. They are isolated and would be difficult and uneconomical to manage. These lands would be available for disposal through exchange or sale.

Acreage and Land Status

Legal Description	O&C	P.D.	CBWR	Legal Description	O&C	P.D.	CBWR
1. T. 30 S., R. 2 W., W.M. Sec. 32, Lot 3; Sec. 34, SE1/4 SW1/4 .			42 40	9. T. 23 S., R. 4 W., W.M. Sec. 7, Lot 4, NE1/4 NE1/4 , SE1/4 SW1/4 , W1/2SE1/4 , SE1/4 SE1/4 ;	240 640		
2. T. 31 S., R. 2 W., W.M. Sec. 4, Lots 1 and 8.			84	Sec. 17, All; Sec. 19, Lots 2,3,4, NE1/4 ,SE1/4 NW1/4 ,E1/2SW1/4 ;407 Sec. 20, SW1/4 NE1/4 , NW1/4 SE1/4 ;		80	
3. T. 24 S., R. 3 W., W.M. Sec. 9, W1/2 W1/4 ; Sec. 15, E1/2NE1/4 , W1/2SE1/4 , SE1/4 SE1/4 ; Sec. 17, Lots 1,2,3, and 4; Sec. 19, Lots 5 to 12, inclusive; Sec. 21, NW1/4 SW1/4 Sec. 22, SW1/4 NE1/4 , NW1/4 SW1/4 ; Sec. 23, NW1/4 NW1/4 ; Sec. 31, Lot 1, N1/2NE1/4 , SW1/4 NE1/4 , E1/2NW1/4 , SE1/4 SE1/4 .	160 200 154 217 40		80	10. T. 24 S., R. 4 W., W.M. Sec. 5, Lots 3 and 4, W1/2SE1/4 , Sec. 25, N1/2, NW1/4 SW1/4 , SE1/4 ; Sec. 29, NE1/4 SE1/4 *; Sec. 33, SE1/4 *; Sec. 35, W1/2NE1/4 , E1/2NW1/4 , SW1/4 NW1/4 , N1/2SW1/4 *.	154 520 40 160 280		
4. T. 25 S., R. 3 W., W.M. Sec. 3, Lots 5,6,7,and 8; Sec. 4, Lot 5; Sec. 5, Lots 5 and 6; Sec. 9, Lots 1 to 5, inclusive.	98 52 223		23	11. T. 25 S., R. 4 W., W.M. Sec. 3, NE1/4 NW1/4 , NW1/4 SE1/4 *; Sec. 16, NE1/4 NW1/4 ; Sec. 17, Lot 5.	82 17		40
5. T. 27 S., R. 3 W., W.M. Sec. 34, SE1/4 SW1/4 .			40	12. T. 26 S., R. 4 W., W.M. Sec. 10, Lot 1*; Sec. 17, Lots 9 and 10*.		7	
6. T. 30 S., R. 3 W., W.M. Sec. 5, Lots 1 and 2.	19			13. T. 27 S., R. 4 W., W.M. Sec. 7, Lot 2*; Sec. 33, NW1/4 SW1/4 .	4		40
7. T. 21 S., R. 4 W., W.M. Sec. 19, NW1/4 SE1/4 ; Sec. 31, SW1/4 SW1/4 , S1/2SE1/4 ; Sec. 33, S1/2SW1/4 .	40 122 80			14. T. 28 S., R. 4 W., W.M. Sec. 29, SE1/4 NE1/4 .	40		
8. T. 22 S., R. 4 W., W.M. Sec. 7, NE1/4 , NW1/4 NW1/4 , NE1/4 SE1/4 .	250			15. T. 30 S., R. 4 W., W.M. Sec. 1, Lot 9.	4		

Acreage and Land Status (continued)

Legal Description	O&C	P.D.	CBWR	Legal Description	O&C	P.D.	CBWR
16. T. 21 S., R. 5 W., W.M. Sec. 13, NE1/4 SW1/4 , W1/2SE1/4 ;	120			21. T. 28 S., R. 5 W., W.M. Sec. 23, SW1/4 NW1/4 ;	40		
Sec. 21, NE1/4 NW1/4 ;	40			Sec. 28, NW1/4 NW1/4 ;		40	
Sec. 25, S1/2NE1/4 , E1/2NW1/4 , NE1/4 SE1/4 ;	200			Sec. 29, E1/2NE1/4 ;	80		
Sec. 27, E1/2NE1/4 , NE1/4 SW1/4 ;	120			Sec. 31, NE1/4 SE1/4 .	40		
Sec.29, NE1/4 SW1/4 ;	40			22. T. 29 S., R. 5 W., W.M. Sec. 29, NE1/4 NE1/4 .	40		
Sec.33, W1/2NW1/4 .	80			23. T. 30 S., R. 5 W., W.M. Sec. 9, Lots 3 and 4;	77		
17. T. 22 S., R. 5 W., W.M. Sec. 1, Lots 1, 2, 3, and 4, S1/2N1/2, S1/2;	634			Sec. 13, Lot 1;	21		
Sec. 3, Lots 1, 2, SW1/4 NE1/4 , S1/2NW1/4 ;	197			Sec. 17, NE1/4 NE1/4 , N1/2NW1/4 , SW1/4 NW1/4 ;	160		
Sec. 5, NW1/4 NE1/4 , N1/2NW1/4 , SW1/4 NW1/4 , NW1/4 SW1/4 ,	206			Sec. 19, Lot 1;	38		
Sec. 11, NE1/4 , SWNW1/4 , W1/2SW;	280			Sec. 29, SE1/4 SW1/4 , S1/2SE1/4 .	120		
Sec. 15, N1/2NE1/4 , SW1/4 NE1/4 ;	120			24. T. 31 S., R. 5 W., W.M. Sec. 4, Lot 6.	33		
Sec. 19, SE1/4 NE1/4 ;	40			25. T. 22 S., R. 6 W., W.M. Sec. 15, SE1/4 SW1/4 ;	40		
Sec. 23, NE1/4 SE1/4 , S1/2SE1/4 ;	120			Sec. 23, W1/2NW1/4 , SW1/4 , S1/2SE1/4 ;	320		
Sec. 25, SW1/4 NE1/4 , S1/2NW1/4 , SW1/4 , W1/2SE1/4 ;	360			Sec. 35, S1/2S1/2.	160		
Sec. 33, W1/2NE1/4 , NW1/4 , NE1/4 SW1/4 ;	280			26. T. 23 S., R. 6 W., W.M. Sec. 1, Lots 5, 6, and 7.	134		
Sec. 35, Lot 1, E1/2NE1/4 , N1/2NW1/4 .	180			27. T. 24 S., R. 6 W., W.M. Sec. 11, N1/2NW1/4 , S1/2SE1/4 ;	160		
18. T. 23 S., R. 5 W., W.M. Sec. 5, NW1/4 , N1/2SW1/4 , SE1/4 SW1/4 ;	276			Sec. 15, E1/2NW1/4 ;	80		
Sec. 7, NW1/4 NE1/4 , SE1/4 SE1/4 ;	80			Sec. 27, W1/2, SW1/4 SE1/4 .	360		
Sec. 13, E1/2NE1/4 , SE1/4 ;	240			28. T. 25 S., R. 6 W., W.M. Sec. 3, NW1/4 NE1/4 , NE1/4 SW1/4 , NE1/4 SE1/4 ;	122		
Sec. 17, S1/2SW1/4 ;	80			Sec. 7, Lots 1, 2, 3, and 4, E1/2NW1/4 ;	244		
Sec. 21, NW1/4 NW1/4 .	40			Sec. 33, SE1/4 SE1/4 .	40		
19. T. 24 S., R. 5 W., W.M. Sec. 29, Lot 5.	28			29. T. 26 S., R. 6 W., W.M. Sec. 3, SE1/4 NE1/4 , NE1/4 SE1/4 ;	80		
20. T. 25 S., R. 5 W., W.M. Sec. 23, NE1/4 SW1/4	40			Sec. 17, Lot 2, SE1/4 NW1/4 , SE1/4 SW1/4 , SW1/4 SE1/4 .	126		
Sec. 27, N1/2NW1/4 ;	80			30. T. 29 S., R. 6 W., W.M. Sec. 17, Lots 9, 10, and 11, SE1/4 SE1/4 ;	102		
Sec. 29, S1/2NE1/4 .	80			Sec. 19, NW1/4 NE1/4 , N1/2NW1/4 , SW1/4 SE1/4 .	164		

Acreage and Land Status (continued)

Legal Description	O&C	P.D.	CBWR	Legal Description	O&C	P.D.	CBWR
31. T. 30 S., R. 6 W., W.M.				33. T. 29 S., R. 7 W., W.M.			
Sec. 18, Lots 1 and 2;			39	Sec. 5, NW1/4 SW1/4 .	40		
Sec. 20, Lots 1,2, and 3;			58				
Sec. 21, NW1/4 NE1/4 ,				Sub Totals	11,918	832	842
NE1/4 NW1/4 , SE1/4 ;	240						
Sec. 25, SE1/4 SE1/4 ;	40			Total	13,952		
Sec. 29, N1/2NW1/4 .	80						
32. T. 28 S., R. 7 W., W.M.							
Sec. 11, SW1/4 SE1/4 ;			40				
Sec. 14, Lot 1, N1/2NE1/4 ;		99					
Sec. 15, Lots 7 to 13,			197				
inclusive;							
Sec. 21, N1/2, N1/2S1/2,			520				
SW1/4 SW1/4 ;							
Sec. 22, SE1/4 NE1/4 ,							
S1/2NW1/4 ;		120					
Sec. 27, Lots 3 and 4.			85				

*Columbian White Tail Deer habitat which would only be disposed after Columbia White Tailed Deer acquisition proposal completed.

Appendix E

SEIS Record of Decision

Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl

Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl

This appendix consists of the Record of Decision and its Attachment A, published in April 1994, for the Supplemental Environmental Impact Statement on Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl. It is referred to in this PRMP/FEIS as the SEIS ROD.

The ROD for the SEIS is bound separately from the PRMP/FEIS and is incorporated by reference. The Draft and Final SEIS and the SEIS ROD were sent to those who received copies of the Draft Roseburg District Resource Management Plan and

Environmental Impact Statement. It was also sent to agencies, libraries, and others who requested it. It is available upon request.

To obtain a copy of the Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl send a request in writing to:

Regional Ecosystem Office
PO Box 3623
Portland, Oregon 97208-3623

Appendix F

Key Sections of the 1993 Record of Decision on Pacific Yew Environmental Impact Statement

The following is excerpted verbatim from the Record of Decision, Pacific Yew of September, 1993. The remainder of the Record of Decision is incorporated by reference.

The Decision

It is our decision to select Alternative B as the Pacific yew harvest strategy for the National Forest System lands and lands administered by the Bureau of Land Management in Washington, Oregon, California, Idaho, and Montana for the next five years (1993-1997). Our selection of Alternative B is based on the analysis in the FEIS, consideration of public comments on the DEIS, and a significant reduction in demand for yew from federal lands for taxol production.

Alternative B permits harvest of any part of the Pacific yew for taxol production from timber sale units and where it might otherwise be destroyed. For the purpose of this document, timber sale units are defined as any area within a timber sale which has a silvicultural prescription for a clearcut², shelterwood², or seed tree² harvest method. Pacific yew may also be harvested for taxol from other areas where the yew would otherwise be destroyed by such activities as other timber harvesting, road building or other construction, a prescribed fire treatment, or similar activities. Site-specific environmental analyses are required before any yew harvest takes place.

We recognize that other parts of the yew, such as seed or scion material, may be needed for research or propagation purposes. This decision permits non-destructive harvest (where tree or shrub is not killed) of small quantities of such material for these purposes in any area where allowed by forest plans, BLM resource management plans (draft or final), or new agency resource plans.

Under this alternative, 258,000 to 386,000 pounds of dry bark and/or 686,000 to 1,030,000 pounds of dry needles from an estimated 52,000 to 78,000 yew

would be available each year for harvest from National Forest System and BLM lands. These estimates are based on the number of yew per acre found in the 1992 Pacific yew inventory and the projected number of acres for timber sales described in forest plans and adjusted according to the FEIS for Management for the Northern Spotted Owl in National Forests (for Forest Service) or in draft resource management plans (for BLM). Many other decisions are currently being made that will most likely reduce the number of timber sale acres and therefore reduce the number of available yew trees and pounds of bark and needles. Under Alternative B, the production of yew from federal lands is largely dependent on the timber harvest program.

Alternative B provides for protection of some of the yew remaining after yew harvest; every sale unit would be regenerated to preharvest or prescribed levels. Special genetic reserves would not be established; however, all acres not committed to timber sales as defined above, would function as genetic reservoirs.

In summary, Alternative B emphasizes utilization of Pacific yew where it would otherwise be wasted. Production of yew would be dependent on the Forest Service and BLM timber harvest programs. It affords the highest degree of protection to the yew by virtue of allowing the lowest level of harvest (with the exception of Alternative A).

Mitigation Measures

The mitigation measures in the FEIS were developed using "An Interim Guide to the Conservation and Management of Pacific Yew, as revised April 1993"³ as well as suggestions from the public. They were designed to protect the yew and the ecosystem. All practical means to avoid or minimize environmental harm from the selected alternative have been adopted. The mitigation measures for Alternative B follow. These apply only to areas where yew is harvested for taxol.

Appendix F

- If a timber sale is planned in a unique area where the only yew in the drainage is located in the sale area, then mitigation is required to assure the protection of this yew population. The purpose for this would be to protect the genetic importance of this unique population from timber sale unit locations.
- Consider including vigorous, undamaged yew trees or shrubs in the green tree reserves whenever possible.
- Harvest yew only where practical (i.e. sufficient number of stems of utilizable size).
- Where yew harvest is planned, harvest yew in the sale unit prior to the harvest of other tree species, to the extent that timber harvesters' health and safety will not be jeopardized. Preharvesting may be accomplished by decking yew logs in specific locations within the sale unit during logging operations.
- Harvest yew that is not in the residual green tree reserve.
- Do not harvest yew for the primary purpose of yew products within 75 feet slope distance from the average high-water level of a perennial stream. Where forest plans, resource management plans, or other plans or prescriptions set wider streamside buffers, these greater buffers will be adhered to.
- Site-specific prescriptions will identify logging systems, site preparation and fuels reduction treatments, and conifer regeneration plans with regard to yew survival and regeneration.
- Use one or more of the following methods to maintain or replace yew on the site at preharvest levels. Where preharvest yew densities are estimated to be greater than 50 yew plants per acre, then a minimum of 50 yew plants per acre will be prescribed in site-specific prescriptions.
 1. Retain and protect as much of the residual yew (stumps, trees, shrubs, advanced regeneration remaining after harvest) as possible and practical from post-harvest activities such as slash piling and burning. Plan logging systems and slash disposal methods which favor the survival of residual yew plants and stumps, e.g., grapple piling or combined machine and burning methods or special burn prescriptions. Include retention of yew and yew stumps as one of the

prescribed fire objectives in burning plans. Leave litter and down wood in those patches for seedling establishment.

Protect yew stumps by the following.

- a. To facilitate sprouting, leave yew tree stumps at the scientifically recommended height (currently 12" high). Yew shrubs should be cut to leave a similar length from the root collar.
 - b. Leave bark intact on yew stumps.
 - c. Whenever possible and practical, shade yew stumps with slash or adjacent vegetation and position reserve green trees to provide shade for yew stumps and advanced yew regeneration. Shading is not normally necessary on shrub form yew; site-specific analysis may help determine how much shading is needed.
2. Encourage natural regeneration (from seed already present on site) by using any site preparation methods known to favor yew seed germination and establishment. Site-specific prescriptions will provide seed sources and desired site conditions for natural regeneration of yew and protect concentrations of existing yew where feasible, while still meeting other management objectives. Where on-the-ground conditions preclude this, planting of yew will be prescribed.
 3. Plant seedlings according to site-specific prescriptions if prescribed regeneration of yew has not been achieved and there is assurance that regeneration by other means is not occurring. Obtain rooted cuttings or seed or seedlings from sources within the local management area. Cuttings could be collected before harvest. Animal protection measures need to be considered where browsing of young yew is predicted. Refer to "An Interim Guide to the Conservation and Management of Pacific Yew," page 27, for transfer of genetic material guidelines.
- *Monitoring:* Where possible, monitor yew regeneration in conjunction with normal regeneration and other area surveys.

- *Endangered Species Act Consultation:* Yew harvest will be conducted in accordance with all conditions, restrictions, and monitoring procedures that are developed during project level Section 7 consultation required by the Endangered Species Act.
- *Seasonal Restrictions for Listed Species:* Pacific yew harvest will follow the appropriate seasonal restrictions for the affected listed species indicated during the project level (site-specific) Section 7 consultation required by the Endangered Species Act.
- *Utilization of Yew Material:* Follow current Forest Service and BLM policies for utilization of yew wood, bark, and needles. These policies may differ between Forest Service regions or national forests or between BLM districts.
- *Transfer of Yew, Administration of Permits, and Theft Prevention:* Follow current Forest Service and BLM policies for transfer of yew, administration of permits, and theft prevention.
- *Tribal Treaties:* Comply with all Native American tribal treaties and consult with tribes where yew harvest may impact trust lands.

Monitoring

Monitoring yew harvest, yew survival and regeneration, and protection of other resources will be guided by Forest Service and BLM harvest policies and requirements in forest plans and resource management plans, as well as monitoring identified in site- specific analyses. The FEIS requires that yew regeneration be monitored in conjunction with other conifer regeneration surveys (Appendix B-1 in FEIS).

² Harvest method terminology may change. These terms maybe replaced with their equivalents using ecosystem management or other terminology.

³ U.S. Department of Agriculture, Forest Service, 1992. An Interim Guide to the Conservation and Management of the Pacific Yew. Pacific Northwest Region. 78 p.

Appendix G

Summary of Scoping

Scoping of the Roseburg District Resource Management Plan/Environmental Impact Statement (RMP/EIS) began in September 1986, when a mailer was sent to a mailing list of some 1000 parties, inviting them to identify issues and concerns for BLM to consider in the planning process. An open house was held by BLM's Roseburg District during the comment period, to help interested parties focus on the question.

With the comments received, the district's planning team and managers distilled a list of issues and concerns. BLM distinguished an issue as a matter of controversy or dispute over resource management activities or land use that is well defined or topically discrete and can be addressed in the formulation of planning alternatives. In practice, issues are resolved by resource allocations and restrictions. Concerns, on the other hand, are generally not so well defined, or do not directly involve controversy or disputes over resource management activities or land use allocations, and do not lend themselves to formulating land use alternatives. Concerns are usually addressed by analysis and documentation in the RMP/EIS. Some concerns are not addressed by the RMP/EIS, as they are beyond the control of the State Director, are unrelated administrative problems, or are not within the legal jurisdiction of BLM.

The issues and concerns identified are described in Chapter 1. This list of issues and concerns was sent to interested parties in March of 1987.

Further scoping after March of 1987 related to refinement of the issues, and determination of a reasonable range of alternatives to address in the RMP/EIS. The latter facet of scoping was handled through the development of State Director guidance for formulation of alternatives. The development of State Director guidance for the RMP process is discussed in Appendix B.

In public comments and internal discussions, there were a number of alternatives, or potential elements of alternatives, considered but eliminated from detailed analysis. These are summarized in the following discussions:

- Alternatives that would meet specified timber production target levels (e.g., one identified in a

regional supply analysis or one that would maintain the level in existing plans). Such alternatives could be explicitly designed only with an optimization model. Early in the planning process, BLM chose not to invest the many millions of dollars that would have been necessary to adopt and use an optimization model in its western Oregon planning effort.

- Alternatives that explicitly reflect the policies and programs of the O&C counties, and of the State. Until opportunities and tradeoffs are fully analyzed, such alternatives could not be formulated. At that point in the process, it was BLM's intent to develop a preferred alternative consistent with those policies and programs to the extent they are consistent with each other and also consistent with Federal laws and regulations.
- An alternative based on the assumption that the Federal Land Policy Management Act, rather than the O&C Act, was the predominant statutory mandate for management of the O&C and Coos Bay Wagon Road lands. None of the initial set of alternatives was based on a specific real or assumed statutory mandate. BLM believes that management under the Federal Land Policy Management Act falls within the range established by the initial set of alternatives.
- A "no planned timber harvest" alternative. BLM considers such an alternative for all BLM-administered lands in western Oregon outside the reasonable range of alternatives. The counterpart of a no timber harvest alternative would be an alternative that would remove all merchantable timber over the life of the plan. Such a radical departure from sustained yield principles on either end is clearly outside the reasonable range of alternatives.
- An alternative which would forego slash burning; one that would forego use of herbicides. These activities and the options of foregoing them were addressed in BLM's "Environmental Impact Statement, Western Oregon Program-Management of Competing Vegetation," 1989. This RMP/EIS is tiered to that Environmental Impact Statement.

- An alternative that uses uneven aged management as the predominant silvicultural system. In many locations that prescription would fail to meet reforestation standards, a violation of the sustained yield mandate. Uneven aged management has been considered for use in stands where it would be economically and environmentally feasible and reforestation standards could be met.
- An alternative which excludes Site IV lands from timber harvest. Such an alternative would not address any important environmental or resource management objectives better than options already being addressed.
- An alternative that maximizes timber production subject to the constraint of economic feasibility. Rather than design and fully analyze an entire alternative with this constraint, BLM concluded that it was more appropriate to run a sensitivity test of Alternative A, showing the nondeclining timber harvest level if it were so constrained. In the Roseburg District, the economic feasibility test showed a difference in Allowable Sale Quantity of less than one percent.
- Alternatives which vary in size of spotted owl habitat protected for each nest site. In light of the Interagency Scientific Committee report and subsequent proposals by the Fish and Wildlife Service, BLM concluded that such variation had little relevance.
- An alternative that would protect 110 spotted owl areas, as provided for in the 1987 revised BLM-Oregon Department of Fish and Wildlife agreement, was originally proposed by BLM. After the Interagency Scientific Committee report was released in 1990, this alternative no longer seemed relevant.
- Alternatives that would maintain older forest blocks by managing large blocks of about 3,000 acres and small blocks of about 200 acres on a 350-year rotation. Such alternatives were originally proposed by BLM, but were dropped when both the Interagency Scientific Committee report and protective Congressional bills stressed not harvesting important older forest stands at all. A sensitivity analysis of Alternative B was substituted, which comes close to the suggested approach.
- An alternative originally proposed by BLM would have tried to provide optimal habitat diversity through habitat management for all priority species. It would have allocated enough lands in extended (350-year) rotations so that mature and old-growth stands would represent at least 30 percent of BLM-administered forest land. This alternative was dropped in favor of the management constraints of a Congressional bill, which were incorporated into Alternative E.
- Alternatives that allocate a considerable percentage of the land base to timber production but place half or more of that land on extended rotations of 150 years or longer. Most components of such an alternative would be identifiable from other alternatives and sensitivity analyses, but a specific sensitivity analysis of Alternative B was added, putting all lands allocated primarily to timber production on a rotation of 150 years.
- Alternatives which vary in snag (wildlife tree) protection from 20 percent to 80 percent of optimum population levels. Although such variation is not an explicit objective of the alternatives, they were expected to vary that widely.
- An alternative that manages as Visual Resource Management Class II all lands inventoried as Visual Resource Management Classes III and IV. Such an alternative would only be logical if matched with the other goals of an alternative with a timber harvest base at least as constrained as Alternative E. This management option, intended to optimize protection of scenic values even on areas identified in inventories as low in scenic value, was felt to be unreasonable in light of the many other constraints on Alternative E.
- An alternative that provides a transition zone on intermittent streams which leaves an undisturbed soil mantle and vegetation, but not necessarily standing timber. While this would be a relevant objective to entertain, it would not be practical, because harvesting timber under such constraints would often not be economically feasible.
- An alternative protecting a minimum of 1/4-mile wide Riparian Management Areas along third order and higher streams, Class I streams and other waters; and maintaining and enhancing water quality at the highest level of water quality required for municipal use. Such an alternative would exclude almost all commercial forest lands from timber management. Such extensive Riparian Management Areas would be far in excess of what is needed to protect water quality and riparian values. Thus, it was considered outside the range of reasonable alternatives.

Appendix H

Comment Letters from Federal, State, and Local Government

See Volume 3.

Appendix I Response to Comment

See Volume 3.

Appendix J

Best Management Practices

Introduction

Best Management Practices are identified and required by the Clean Water Act as amended by the Water Quality Act of 1987. Best Management Practices are the primary mechanism to prevent and control to the “maximum extent practicable” nonpoint source pollution and achieve Oregon water quality standards. Best Management Practices are also identified in this document for the protection of soil productivity.

Through the implementation of Best Management Practices, the Bureau of Land Management fulfills the requirement for federal agencies to comply with all State requirements and programs to control water pollution from nonpoint sources (per Clean Water Act Section 313 and Executive Order 12088). The Bureau of Land Management under a memorandum of agreement with the Oregon Department of Environmental Quality is a “Designated Management Agency charged with implementing and enforcing natural resource management programs for the protection of water quality on federal lands under its jurisdiction” through Best Management Practices.

Best Management Practices are defined as methods, measures or practices which are site specific to protect water quality or soil protective. Best Management Practices include, but are not limited to, structural and nonstructural controls, operations, and maintenance procedures. In this document, Best Management Practices are a compilation of existing policies and guidelines and commonly employed practices to protect water quality and soil productivity.

Best Management Practices are selected during the NEPA interdisciplinary process on a site specific basis to meet overall ecosystem management goals. This document does not provide an exhaustive list of Best Management Practices. Additional measures may be identified during watershed analysis or the NEPA process for a specific activity. The selection and implementation of Best Management Practices initiates an iterative process that includes monitoring the effectiveness and modification when water or soil goals are not achieved.

Best Management Practices

I. Project or Activity

A. Project Planning and Design.

Objectives: Use the planning process to ensure that timber sales are designed to maintain favorable conditions of soil productivity, water flow, and water quality for the beneficial uses in the watershed.

Practices:

1. Use information from watershed analysis to prepare project level plans.
2. Use Timber Production Capability Classification to identify areas classified as unsuitable for timber production.
3. Use Timber Production Capability Classification and field investigations to identify areas classified as fragile suitable, restricted.
4. Use the planning process to identify, evaluate, and map potential problems (e.g. slump prone areas, saturated areas, and slide areas). Design appropriate preventive measures.
5. Design proposed harvest units to avoid, mitigate, or minimize potential adverse impacts to soil and water. Evaluation factors include the following: soil characteristics, watershed physiography, current watershed and stream channel conditions, proposed roads, skid trails, and logging system design.
6. Plan mitigation measures if adverse impacts to water quality/quantity or soil productivity may result from the proposed action.

7. Analyze watershed cumulative effects and provide mitigation measures if necessary to meet water quality standards.
8. Disperse activities over time and space.
9. Include the location of all stream channels and wetlands (spring, meadows, lakes, bogs, etc.) on timber sale maps and/or contracts.
10. Location of fragile (nonsuitable and suitable) areas that require special management practices.
11. Include on timber sale maps and/or contracts the location of protection required for each stream channel, wetland, and fragile area.

B. Riparian Reserve Protection

Objectives: To prevent damage to riparian ecosystems and disturbance to streambanks, protect the natural flow of streams and preserve nutrient cycling from woody debris consistent with the Aquatic Conservation Strategy.

Practices:

1. Allow no mineral lease operations, chemical loading operations, or similar toxic pollutant activities within 200 feet of all water bodies.
2. Directionally fell trees to Riparian Reserves when harvesting within a tree length of any Riparian Reserve.
3. All snags in the Riparian Reserve would be left except where safety dictate removal, consistent with the Aquatic Conservation Strategy.
4. Nonmerchantable down logs, including trees or logs down prior to logging, would be left in the Riparian Management Area; all down logs would be left in stream channels.
5. Avoid disturbance of unstable banks and headwalls.

C. Yarding Methods.

Objectives: To minimize loss of soil productivity and reduce potential for surface runoff and subsequent degradation due to surface disturbance or compaction.

Practices:

1. Cable.
 - a. Use partial suspension when yarding on erodible or ravel prone areas, where practical.
 - b. Use full suspension when yarding on fragile soils, where practical.
 - c. Use seasonal restriction if appropriate suspension cannot be achieved by yarding equipment.
 - d. Avoid downhill yarding where practical.
 - e. Hand waterbar cable yarding corridors immediately after use on sensitive soils (Category 1) where gouging occurs.
2. Ground-based
 - a. Use existing skid roads wherever possible.
 - b. Limit new skid trails to slopes less than 35 percent.
 - c. Use designated skid roads to maintain compaction levels of skid roads plus landings at less than 10 percent.
 - d. Restrict tractor operations to these trails and limiting operations to periods of low soil moisture, when soils have the most resistance to compaction (dry season).
 - e. In partial cut areas, locate skid roads so that they can be used for final harvest.
 - f. Till all compacted trails, including skid trails from previous entries, with a properly designed self-drafting winged subsoiler.

- g. Avoid tractor yarding on areas where soil damage cannot be mitigated due to physical conditions.
- h. Avoid placement of skid roads through areas of highwater tables or where the skid roads would channel water into unstable headwall areas.
- i. Waterbar skid roads to minimize erosion.
- j. Avoid use of wide track vehicles or more than one machine on a skid road at any given time to minimize the width of the skidroads. (On multiple pass skid roads, wide track vehicles result in wider skid roads, and after multiple passes, drive the compaction deeper than a regular width track; however, they are good for one pass operations such as incidental scattered salvage or site preparation).
- k. Leave large downed woody debris on site.
- l. Rip existing tractor skid trails prior to felling timber with a properly designed winged subsoiler.

II. Roads

A. Planning

Objective: To plan road systems in a manner that meets resource objectives and minimize resource damage.

Practices:

1. Use an interdisciplinary process to develop an overall transportation system.
2. Establish road management objectives that minimize adverse environmental impacts given the use of the road.
3. Avoid fragile and unstable areas or plan appropriate mitigation measures.

4. Minimize the percent of the land base converted to roads and landings; avoid heavy concentrations of roads and landings to minimize impacts from increased peak flows and erosion of the compacted surfaced.

B. Location

Objectives: To minimize mass soil movement, erosion, and sedimentation.

Practices:

1. Locate roads out of Riparian Reserves where practical alternatives exist.
2. Locate roads on stable positions (e.g. ridges, natural benches, and flatter transitional slopes near ridges and valley bottoms). Implement extra mitigation measures when crossing unstable areas is necessary.
3. Avoid headwalls whenever possible.
4. Avoid construction on unstable areas where practical.
5. Locate roads to minimize heights of cuts. Avoid high, steeply sloping cuts in highly fractured bedrock.
6. Locate roads on well drained soil types.
7. Locate stream crossing sites where channels are well defined, unobstructed, and straight.

C. General Design Features

Objective: To design the lowest standard of road consistent with use objectives and resource protection needs.

Practices:

1. Road design standards and design criteria are based on road management objectives such as traffic requirements of the sale and the overall transportation plan, an economic analysis, safety requirements, resource objectives, and the minimization of damage to the environment.

2. Consider future maintenance concerns and needs when designing roads.
 3. Preferred road gradients are two to ten percent with a maximum grade of 15 percent. Consider steeper grades in those situations where they will result in less environmental impact. Avoid grade less than two percent.
 4. Outsloping - Outsloping of the road prism for surface drainage is normally recommended for local spurs or minor collector roads where low volume traffic and lower traffic speeds are anticipated. It is also recommended in situations where long intervals between maintenance will occur and where minimum excavation is desired. Outsloping is not recommended on gradients over eight to ten percent.
 5. Insloping - Insloping of the road prism is an acceptable practice on roads with gradients over ten percent where the underlying soil formation is very rocky and not subject to appreciable erosion or failure.
 6. Minimize excavation through the following actions whenever possible: use of balanced earthwork, narrow road width, and endhauling where slopes are greater than 60 percent.
 7. Locate waste areas suitable for depositing excess excavated material.
 8. Endhaul waste materials generated during road and ditch maintenance if side slopes exceed 60 percent or where unacceptable environmental damage may occur.
 9. Endhaul excess materials where slopes have been over loaded.
 10. Surface roads if they will be subject to traffic during wet weather. The depth and gradation of surfacing will usually be determined by traffic type, frequency, weight, maintenance objectives, and the stability and strength of the road foundation and surface materials.
 11. Provide for vegetative or artificial stabilization of cut and fill slopes in the design process. Avoid establishment of vegetation where it inhibits drainage from the road surface or where it restricts safety or maintenance.
 12. Prior to completion of design drawings, field check the design to assure that it fits the terrain, drainage needs have been satisfied, and all critical slope conditions have been identified and adequate design solutions applied.
 13. Avoid diverting water into headwalls — roll the grade to channel water away from headwalls — check maintenance on existing roads to ensure water isn't allowed to remain on the road and/or diverted into unstable headwall areas.
 14. Unless a road is needed for continued resource management, use a temporary road and put it to bed after use, using methods such as blocking, ripping, seeding, mulching, fertilizing, and waterbarring.
 15. Minimize potential erosion on a road — if unsurfaced, put it to bed; otherwise apply rock to minimize surface erosion.
 16. Approve location of all landings and landing clearing limits prior to clearing.
 17. Select landing locations on the basis of the least amount of excavation and erosion potential where sidecast will not enter drainages or damage other sensitive areas.
 18. Avoid landing locations alongside or in meadows, or other wetland areas.
 19. Restore the shape of landings back to the natural configurations or shape to direct the runoff to preselected spots where water can be dispersed to natural, well-vegetated, stable ground.
- D. Design of Cross Drains
- Objectives: To minimize concentrated water volume and velocity on the road prism, thus to reduce movement and sedimentation.

Practices:

1. Design placement of all surface cross drains to avoid discharge onto erodible (unprotected) slopes or directly into stream channels. Provide a buffer or sediment basin between the cross drain outlet and the stream channel.
2. Locate culverts or drainage dips in such a manner to avoid outflows onto unstable terrain such as headwalls and slumps or block failure zones. Provide adequate spacing to avoid accumulation of water in ditches or surfaces through these areas.
3. Provide energy dissipators or armoring at cross drain outlets or drain dips where water is discharged onto loose material or erodible soil or steep slopes.
4. Use the guide for drainage spacing by soil erosion classes and road grade shown in Table J-1.
5. Consider using drainage dips in lieu of culverts on roads which have gradients less than ten percent or where road management objectives result in blocking roads. Avoid drainage dips on road gradients over ten percent.
6. Locate drainage dips where water might accumulate, or where there is an outside berm which prevents drainage from the roadway.
7. Cut all cannon culverts to the proper length, downspout, and provide for energy dissipation.
8. When sediment is a problem, design cross drainage culverts or drainage dips immediately upgrade of stream crossings to prevent ditch sediment from entering the stream.
9. Rolling gradients is a recommended design practice in erodible and unstable soils to reduce surface water volume and velocities and culvert requirements.
10. Consider use of slotted riser inlets on granitic and schist soils to prevent culvert plugging.

E. Design of Stream Crossings

Objective: To preclude stream crossings from being a direct source of sediment to streams thus minimizing water quality degradation and provide unobstructed movement for aquatic fauna.

Practices:

1. Pipe arch culverts are appropriate on most fishery streams. Bottomless arch culverts and bridges will be necessary in some instances where gradients greater than .5 percent, stream discharge and value of the fishery resource dictate that special engineering considerations are necessary to ensure uninterrupted fish passage. A round culvert is suitable for nonfishery streams since fish passage is not a concern in these instances.
2. Use the theoretical 100 year flood as design criteria for new culverts, bridges, and other stream crossings.
3. Minimize the number of crossings on streams.
4. Where feasible, design culvert placement on a straight reach of stream to minimize erosion at both ends of the culvert. Design adequate stream bank protection (e.g. riprap) where scouring would occur. Avoid locations that require stream channel to be straightened beyond the length of a culvert to facilitate installation of a road crossing.
5. Evaluate the advantages and disadvantages of a temporary versus permanent crossing structure in terms of economics, maintenance, and resource requirements for access to the area during all seasons over the long term.
6. Minimize the number of temporary crossings on a particular stream.
7. Low ford stream crossing is appropriate only when site conditions make it impractical or uneconomical to utilize a permanent or temporary crossing structure.

F. Construction

Objective: To create a stable roadway that will minimize soil erosion and water quality degradation.

Practices:

1. Limit road construction to the dry season (generally between May 15 and October 15). When conditions permit operations outside of the dry season, keep erosion control measures current with ground disturbance, to the extent that the affected area can be rapidly closed/ blocked and weatherized if weather conditions warrant.
2. Manage road construction so that any construction can be completed and bare soil can be protected and stabilized prior to fall rains.
3. Confine construction of pioneer road to within the roadway construction limits.
4. Conduct pioneering so as to prevent undercutting of the designated final cutslope and prevent avoidable deposition of materials outside the designated roadway limits. Conduct slope rounding included in the design during the pioneering stage when the pioneer road cut slope is the same as the road backslope. This avoids excess amounts of soil being moved after excavation and embankment operations are completed.
5. Construct embankments of appropriate materials (no slash or other organic matter) using one or more of the following methods:
 - a. layer placement (tractor compaction)
 - b. layer placement (roller compaction)
 - c. controlled compaction (85-90 percent maximum density).
6. Avoid sidestepping where it will adversely affect water quality or weaken stabilized slopes.
7. Place surface drainage prior to fall rains.
8. Clear drainage ditches and natural watercourses above culverts of woody material deposited by construction or logging prior to fall rains.
9. Confine major culvert installation to the period of June 15 to September 15 to minimize sedimentation and the adverse effects of sediment on aquatic life.
10. Divert the stream around the work area to minimize sedimentation effects downstream.
11. Install the culvert as close to zero percent slope as possible on fishery streams but not to exceed 0.5 percent. Place culverts on larger nonfishery streams in the streambed at the existing slope gradient. Energy dissipators (e.g. large rock) placed at the outfall of culverts on small nonfishery streams are recommended to reduce water velocity and minimize scour at the outlet end.
12. Countersink culvert 20 percent of culvert diameter below the streambed to minimize scouring at the outlet. Increase culvert diameters accordingly.
13. Confine activities by heavy equipment in the streambed to the area that is necessary for installation of the structure. Restrict construction equipment to within the approved right-of-way and out of the streambed.
14. Permanent stream crossing structures on fishery streams are recommended to be in place before heavy equipment moves beyond the crossing area. Where this is not feasible, install temporary crossings to minimize stream disturbance.
15. Place riprap on fills around culvert inlets and outlets where appropriate.
16. Where possible, limit the installation and removal of temporary crossing structures to once during the same year and within the prescribed work period. Installation and removal should occur between June 15 and September 15 to minimize adverse effects of sediment on aquatic life.

17. Use backfill material that is as soil free as practicable over temporary culverts. Whenever possible use washed river rock covered by pit run or one inch minus as a compacted running surface.
18. Spread and reshape clean fill material to the original lines of the streambed after a crossing is removed to ensure the stream remains in its channel during high flow.
19. Limit activities of mechanized equipment in the stream channel to the area that is necessary for installation and removal operations.
20. Remove stream crossing drainage structures and in-channel fill material during low flow and prior to fall rains. Reestablish natural drainage configuration.
21. Use washed rock/gravel in a low water ford crossing if it will be used much.
22. Rock the road approaches with 150 feet of each side of a low water ford to prevent washing and softening of the road surface.
23. Construct adequate waterbars on roads, spurs, and skid trails prior to fall rains.
24. Use the following table for waterbar spacing, based on gradient and erosion class.

Table J-1. Guide for Drainage Spacing by Soil Erosion Classes and Road Grade

Water Bar Spacing (in feet)	Erosion Class			
	Gradients (%)	High	Moderate	Low
3-5		200	300	400
6-10		150	200	300
11-15		100	150	200
16-20		75	100	150
21-35		50	75	100
36+		50	50	50

Spacing is determined by slope distance and is the maximum allowed for the grade.

G. Road Renovation/Improvement

Objective: To restore or improve a road to a desired standard in a manner that minimizes sediment production and water quality degradation.

Practices:

1. Improve flat gradients to a minimum of two percent or provide raised subgrade sections (turnpike) to avoid saturation of the road prism.
2. Reconstruct culvert catchbasins to specifications. Catchbasins in sold rock need not be reconstructed provided that culvert entrance specifications are met.
3. Identify potential water problems caused by offsite disturbance and add necessary drainage facilities.
4. Identify ditchline and outlet erosion caused by excessive flows and add necessary drainage facilities and armoring.
5. Replace undersized culverts and repair damaged culverts and downspouts. Improve existing culverts, bridges, and other stream crossings to accommodate at least a 100 year flood when they pose a substantial risk to riparian conditions.
6. Add additional full-rounds, half-rounds, and energy dissipators as needed.
7. Correct special drainage problems (i.e. high water table, seeps) that affect stability of subgrade through the use of perforated drains, geotextiles, drainage bays, etc.
8. Eliminate undesirable berms that impair drainage away from the road prism.
9. Restore outslope or crown sections.
10. Avoid disturbing backslope while reconstructing ditches.
11. Surface inadequately surfaced roads that are to be left open to traffic during wet weather.

12. Require roadside brushing be done in a manner that prevents disturbance to root systems (i.e. avoid using excavators for brushing).

- Exposed soil would be seeded or protected when necessary to keep surface erosion within accepted standards.
- Install stabilization features such as debris racks, bin walls, and rock blankets as needed.

13. Reconstruct poorly built stream crossings with bridges or culverts, insuring proper alignment and grade.

H. Maintenance

Objective: To maintain roads in a manner which provides for water quality protection by minimizing surface erosion, rutting failures, sidecasting, and blockage of drainage facilities.

Practices:

1. Provide the basic custodial required to protect the road investment and to ensure that damage to adjacent land and resources is held to a minimum.
2. Perform blading and shaping in such a manner as to conserve existing surface material, retain the original crowned or outsloped self-drainage cross section, prevent or remove rutting berms (except those designed for slope protection) and other irregularities that retard normal surface runoff. Avoid wasting loose ditch or surface material over the shoulder where it will cause stream sedimentation or weaken slump prone areas. Avoid undercutting of backslopes.
3. Keep road inlet and outlet ditches, catchbasins, and culverts free of obstruction, particularly before and during prolonged winter rainfall. However, hold routine machine cleaning of ditches to a minimum during wet weather.
4. Remove slide material when it is obstructing road surface and ditchline drainage and either utilize for needed road improvement elsewhere or place in

a stable waste area. Avoid sidecasting of slide material where it will damage, overload, or saturate embankments, or flow into downslope drainage courses.

5. Retain vegetation on cut slopes unless it poses a safety hazard or restricts maintenance activities. Accomplish roadside brushing by cutting vegetation rather than pulling it out and disturbing the soil.
6. Patrol areas subject to road damage during periods of high runoff.
7. Reclaim/revegetate all roads not needed for future management activities.
8. Exposed soil would be seeded or protected when necessary to keep surface erosion within accepted standards.
9. Stabilize major failures (landslides) by subsurface drainage, rock blankets, or other methods.

I. Road Closures

Objectives: To prevent erosion and sedimentation of streams from unmaintained roads, and restore site productivity to roads no longer needed.

Practices:

1. Barricade or block road surface using gates, guard rails, earth/log barricades, boulders, logging debris or a combination of these methods. Avoid blocking roads that will need future maintenance (i.e. culverts, potential slides, etc.) with unremovable barricades. Using guardrails, gates or other barricades capable of being opened for roads needing future maintenance.
2. Follow-up on road closures to ensure they are maintained in accordance with design criteria.
3. Install waterbars, cross drains, cross sloping, or drainage dips if not already on road to assure drainage.

4. Till with a winged subsoiler, revegetate for erosion control and site productivity restoration.

K. Water Source Development

Objective: To supply water for road construction, dust abatement and fire protection while maintaining existing water quality and supply and consistent with the Aquatic Conservation Strategy.

Practices:

1. Design and construct durable, long-term water sources.
2. Avoid reduction of downstream flow that would detrimentally affect aquatic resources, fish passage, or other uses.
3. Direct overflow from water holding developments back into the stream.
4. Locate road approaches to instream water source developments to minimize potential impacts in the riparian zone. Rock surface these approaches to reduce the effects of sediment washing into the stream.
5. Avoid use of road fills for water impoundment dams unless specially designed for that purpose.
6. Construct water sources during the dry season (generally between May 15 and October 15).

J. Restoration of Rock Quarries

Objective: To minimize sediment production from quarries that are susceptible to erosion due to steep sideslopes, lack of vegetation, or their proximity to water courses.

Practices:

1. Wherever possible, prior to excavation of the site, remove and stockpile topsoil for surface dressing during the post-operation rehabilitation.
2. Stabilize pit sides and smooth the general pit area.

3. Use seeding, mulching, and drainage to minimize erosion.
4. Rip, waterbar, block, fertilize, and seed access roads to rock pits where no future entry is planned. Rehabilitate or restore quarries in this category to renewable resource levels.

III. Silviculture

A. Riparian Reserve Protection

Objectives: To prevent damage to riparian ecosystems, disturbance to streambanks, deterioration of water quality, and accumulation of slash in streams.

Practices:

1. Directionally fell trees to protect Riparian Reserves when slashing within a tree length of a Riparian Reserve.

B. Mechanical Methods of Site Preparation

Objectives: To maintain soil productivity and water quality while meeting the silviculture objectives.

Practices:

1. Limit the use of tracked equipment that would cause unacceptable soil disturbances or compaction to areas of less than 30 percent slopes.
2. Do not compact skeletal or shallow soils.
3. Till all compacted areas with a properly designed winged subsoiler. This could be waived if inspection reveals that less than two percent of the area is compacted. Compaction of less than two percent is considered to equal less than one percent growth loss.
4. On sites which do not annually dry out enough to provide resistance to traditional tracked equipment, use low-ground-pressure, tracked-type excavators (including: backhoe/grapple/loader/slasher).

5. Restrict tractor operations to dry conditions with less than 25 percent soil moisture content in the upper six inches of soil.
6. Avoid piling concentrations of large logs and stumps.
8. Pile small material (3-8" diameter size predominantly).
9. Burn piles when soil and duff moistures are high.

C. Chemical Methods

Objectives: To protect water quality from pollution, and to enhance solid productivity.

Practices:

1. Refer to vegetation Management EIS.
2. Avoid aerial application when wind speeds would cause drift.
3. Locate heliports and storage areas away from stream channels.
4. Restrict the application within Riparian Reserves.

D. Broadcast Burning

Objectives: To maintain long term soil productivity, organic matter and duff, water quality, retain legacy, and to meet hazard reduction objectives.

Practices:

1. Evaluate need for burning based in soils, plant community, and site preparation criteria. Burn under conditions when a light or moderate burn can be achieved (see guidelines below) on all units to protect soil productivity. The following standards should be followed.
 - a. Category 1 Soils (highly sensitive). Avoid burning.

- b. Category 2 Soils (moderately sensitive). Reduce disturbance, fire intensity, and duration by using the following methods:

- Burn under conditions that result in low intensity fires.
- Burn when soils and duff are moist.
- Avoid burning sparsely vegetated areas on slopes greater than 65 percent.
- Gross yard to break up heavy slash concentrations, and reduce burn intensities.

- Pull slash and woody debris adjacent to landings onto landings before burning.

- c. Category 3 Soils (least sensitive). Write prescriptions to protect a large percentage of the nutrient capital and other beneficial properties in the soil and the forest floor. (Low and moderate intensity burns.)

2. Firetrails.

- a. Construct tractor fire trails with one pass construction during periods of dry soil moisture.
- b. Where the fire trail construction has resulted in compacted surfaces, rip, and waterbar the fire trail (use properly designed winged ripper).
- c. Avoid the placement of tractor constructed fire trails on slopes in excess of 35 percent.
- d. Avoid the placement of any fire trails where water would be channeled into areas of instability or headwalls.
- e. Waterbar all fire trails that may carry water to minimize surface erosion.

E. Thinning

Objectives: To protect soil productivity, water quality, and riparian ecosystems.

Practices:

1. Refer to timber harvest.

IV. Other Activities

A. Firewood.

Objectives: To prevent erosion from road use and water quality degradation.

Practices:

1. Seasonal restriction on firewood cutting when access to cutting area is on an unsurfaced road.
2. Clean all road surfaces, ditches, and catchbasins of debris from wood cutting.

B. Wildfire Control

Objectives: To minimize water quality degradation and maintain soil productivity while achieving rapid and safe suppression of wildfire.

Practices:

1. Limit use of heavy equipment near Riparian Reserves and on steep slopes when possible. Where fire trail entry into a Riparian Reserves is essential, angle the approach rather than have it perpendicular to the Riparian Reserves.
2. Attempt to keep fire retardant out of water sources.
3. Utilize information from burned area surveys to determine if watershed emergency fire rehabilitation is needed.
4. Develop a fire rehabilitation plan through an interdisciplinary process.
5. Select treatments on the basis of on-site values downstream values, probability of successful implementation, social and environmental considerations (including

protection of native plant community), and cost as compared to benefits.

6. Examples of emergency fire rehabilitation treatments include: 1) seeding grasses or other vegetation as needed to provide a protective cover as quickly as possible; 2) mulching with straw or other suitable material; 3) fertilizing; 4) channel stabilization structures; 5) trash racks above road drainage structures; and 6) waterbars on firelines.

C. Watershed Rehabilitation and Fish Habitat Improvement Projects

Objectives: To mitigate and minimize damage to riparian vegetation, streambanks, and stream channels.

Practices:

1. Employ good project planning by an interdisciplinary team.
2. Use corrective measures to repair degraded watershed conditions and restore to predisturbance conditions with a vegetative cover that will maintain or improve soil stability, reduce surface runoff, increase infiltration, and reduce flood occurrence and flood damages.
3. Carefully plan access needs for individual work sites within a project area to minimize exposure of bare soil, compaction, and possible damage to tree roots. Utilize existing trails to the extent practical.
4. Confine work in the stream channels to between June 15 and September 15 to minimize the area of the stream that would be affected by sedimentation during the low flow period.
5. Keep equipment out of streams to extent possible.
6. Limit the amount of streambank excavation to the minimum that is necessary to ensure stability of enhancement structures. Place excavated material as far above the high water marks as possible to avoid its reentry to the stream.

7. Whenever possible obtain logs for habitat improvement structures from outside the riparian zone or at least 200 feet from the stream channel to maintain integrity of riparian habitat and streambanks.
8. Inspect all mechanized equipment daily to help ensure toxic materials such as fuel and hydraulic fluid do not enter the stream.
9. Utilize waterbars, barricades, and seeding to stabilize bare soil areas.

D. Mining

Objectives: To minimize disturbance to soils, riparian ecosystems, streambanks, and stream channels within constraints of surface mining regulations.

Practices:

1. Require the claimant to obtain, all required state and federal operating permits.
2. Locate, design, operate and maintain sediment settling ponds in conformance with State Department of Environmental Quality (DEQ) requirements.
3. Design, locate, and construct stream crossings in conformance with Practices described in Sections II.C and II.D.
4. Use existing roads, skid trails, and stream crossings whenever possible.
5. Prior to the first wet season, rip, waterbar, seed, mulch, and barricade according to BLM specifications, all roads and trails constructed for exploratory purposes that are unnecessary for the mining operation.
6. Waterbar and barricade all natural surface roads and trails when the operation concludes.
7. Rip, waterbar, seed mulch, and barricade all natural surface roads and trails when the operation concludes.
8. Construct a berm or trench between disturbed areas and water courses.

9. Stockpile topsoil for use during reclamation of the site. Construct a berm or trench immediately downslope of the stockpile.
10. Stabilize and contour the area, replace topsoil and mulch, seed and plant the area with tree seedlings in accordance with specifications when no further mining is contemplated.
11. During the period from October 15 to May 15 contour and mulch disturbed areas that will not be mined for at least 30 days.
12. Retain an undisturbed riparian buffer strip between mining operations and water courses to protect integrity of streambanks, provide for water temperature control and for filtration of sediment from surface runoff.
13. Confine operations to bench areas rather than allow encroachment on the stream whenever possible.
14. Locate and maintain sanitation facilities in accordance with State DEQ Regulations.

E. Wetlands

Wetland protection: Maintaining the integrity and functional ability of wetlands by avoidance whenever possible. All wetlands destroyed by construction activities will be ameliorated by creating replacement wetland areas. Protection is accomplished in these areas during timber harvest activities by: a) avoiding disturbance of permanent high water table areas; b) falling and yarding away from wetlands; c) utilizing seasonal restrictions or full suspension over areas when entry is determined to be required; d) avoiding the use of tractors or other ground-basket equipment which may cause disturbance of the wetlands.

Appendix K

Selection of Harvest Scheduling Model and Allowable Sale Quantity Calculation Process

Early in the planning effort, in 1986, BLM began to explore the timber harvest scheduling model options available for BLM's use. A timber harvest scheduling model combines timber production capability, operations inventory, and forest inventory plot data with proposed timber management prescriptions and land use allocations to determine potential annual timber harvest levels and their long term sustainability. By early 1987 we had tentatively identified a model called TRIM-Plus as most relevant to our needs and in the spring of 1987 held public workshops about it for interested parties in some of BLM's western Oregon offices. After considering the comments received that spring and summer, and testing the model on data from the late 1970s, BLM did select the TRIM-Plus Model.

The features of TRIM-Plus most influenced the selection of the model were its ability to:

- Make individual nondeclining harvest level calculations on multiple minimum harvest ages.
- Handle various land use classes simultaneously.
- Be used at district level on enhanced personal computers.
- Provide enhanced report generating.
- Provide simplified input/output data (ease of use).
- Provide relatively inexpensive computer runs.

Although we considered harvest scheduling models of various degrees of complexity, it was our intent to identify a relatively simple and reliable state-of-the-art system. We wanted to be able to interface the selected model with other specific resource analysis models/procedures such as an elk habitat model which will use our automated (mapped) resource data base. The planning process will identify different combinations of land use allocations in terms of acres and the model will compute resulting harvest level impacts in a trackable fashion.

Probable Sale Quantity Calculation Process

Probable Sale Quantity (PSQ) is a term used to describe the allowable harvest levels for the various alternatives that could be maintained without decline over the long term if the schedule of harvests and regeneration were followed. "Allowable" was changed to "Probable" to reflect some uncertainty in the calculations for the various alternatives. These uncertainties are discussed in the Effects on Timber section of Chapter 4 of the PRMP/FEIS. The PSQ is estimated by TRIM-Plus, a binary search type model that has been designed to operate on a desktop PC. TRIM-Plus functions similarly to the SIMIX model used by the BLM to generate PSQs in the 1970's and 1980's. PSQ volumes from TRIM-Plus are in merchantable cubic feet. Equivalent estimates in board feet are provided to help interpret the information.

Harvest scheduling involves quantifying the existing forest inventory and projecting the inventory into the future along with specific management regimes and harvesting constraints to determine a long term, non-declining harvest level. This harvest level is referred to as the PSQ.

The PSQ is determined through the use of Micro*STORMS (a relational data base), Organon, (a growth and yield model) and TRIM-Plus (a harvest scheduling model). Some assumptions about future management that directly affect the ASQ runs in TRIM-Plus include minimum harvest age, regeneration lag, future stocking levels, anticipated gains for planting genetically improved stock, the amount and frequency of precommercial thinning, commercial thinning and fertilization, and the stand age when these treatments are applied.

When all of the acres, volumes and management assumptions are assembled in the appropriate files in TRIM-Plus, the model makes repetitive PSQ runs to find the optimal sustainable harvest level for a particular management scenario. After the total PSQ

run is completed, further analysis of the contribution of each GRU, Resource Area, SYU, or land status type can be made.

Current Acres

GIS Map Acres

Acres for each alternative are derived from digitized GIS map overlays. There is a separate digital map for each topic or theme pertinent to the alternative. These maps can be overlaid or merged to allow analysis and generation of acres for a wide variety of situations.

Micro*STORMS Data Base

The basic storage location for acres and forest related resource information is a large relational data base called Micro*STORMS. The database is separated into three primary files; 1) Forest Operations Inventory (FOI) which includes acreages, timber type, site, treatments, etc., 2) Timber Productivity Classification (TPCC), and 3) 5-Point Continuous Forest Inventory (CFL) plot data.

Within each file, there is a separate record of information for each plot or unit. Each file contains many kinds of data. For example, the FOI file records contain data such as the Basic Resource Unit (BRU) and Existing Stand Condition (ESC) codes, acreage, timber type, site index, accomplished and recommended treatments, timber volumes, stand age, and land use. Information pertinent to the analysis of alternatives from these or other data files has been linked to their respective digitized GIS maps.

Basic Resource Units (BRU). With TRIM-Plus, data is segregated by Sustained Yield Unit (SYU), Resource Area, land status, management status and timber type. These groups of data are called Basic Resource Units. The ASQ and other output data from TRIM-Plus is reported by BRU and for groups of BRUs known as Group Resource units (GRU) as well as for the entire sustained yield unit.

GRU Management Intensity (MI) Levels. Within each GRU in TRIM-Plus model, there are eight available management regimes called MIs that can be used to

simulate various management assumptions or intensity levels. Each requires yields and acres by age class, and information which will direct the shifting of acres from one MI to another during the growth and/or at final harvest for a stand type. Specific configuration of the MI's varies within each GRU and within each alternative.

Existing Stand Condition (ESC) Codes. ESC codes are incorporated in each BRU. ESC codes help to group, sort and track similar kinds of stands. This sorting is accomplished by giving each Micro*STORMS site file record (FOI Unit) an ESC code which best describes the forest stand or condition of a particular unit.

5-Point Continuous Forest Inventory (CFI)

Tree volumes estimates for present stands were derived from 508 permanent inventory plots distributed throughout the District. Both conifers and hardwoods were cruised by certified BLM cruisers to the same standards used in timber sale preparation. Summary plot data is stored in the Micro*Storms data base CFI file. These data include general site and specific stand descriptions such as board foot (BF) and CF volume estimates, growth, basal area, trees per acre, and average diameter at breast height and total tree height.

Yields Estimation

Managed Stands - Yields for managed stands were projected using the Organon growth and yield model. The Organon yield simulator is built upon a database derived from research plots installed in mixed conifer stands of southwestern Oregon. The study area for this model is adjacent to and south of the Roseburg District. The Organon growth and yield model was designed primarily to simulate the growth and yield of Douglas fir and mixed conifer stands of southwestern Oregon. Site index, fertilization, commercial and precommercial thinning, stocking levels, and hardwood competition are some of the input variables that Organon can accommodate in making yield projections. The BLM version of Organon incorporates BLM's own volume regressions and cruising standards.

The Organon model provides an option to use tree list and tree condition data from existing stands as a starting point for simulation. Sources of tree list data

include forest inventory plot strata and/or special stand exams to portray average stand conditions. The simulation of yields for representative future plantations requires considerable professional judgment and knowledge of tree growth and stand characteristics unique to the Roseburg district. An adjustment was made in developing yield curves for fertilization. This adjustment reduced yield 15 percent due to application irregularities. This was based on research data that shows that response is not in direct proportion to application rate. (Silviculture Working Group - April 1989, IM-OR-90-272.)

All Organon yields are gross volumes. Reductions for insect and disease losses, and for defect and breakage based on District timber sale data is applied to the projected yields for future stands. A series of Organon runs were made to determine yields for combinations of operationally feasible and optimal practices.

Gains from the genetic tree improvement program have been calculated by the District Geneticist. To incorporate these gains into TRIM-Plus, the Organon runs were adjusted by raising the site index until volume matches the anticipated gain from planting improved stock. The Effects on Timber section of chapter 4 of this PRMP/FEIS discusses genetic gains and how they were applied to those alternatives with non-traditional silviculture.

Unmanaged Stands - In contrast to yields from published stand tables or simulation used with managed stands, yields for unmanaged stands were calculated from existing plots. These empiric yields are preferred over published yield tables whenever there are sufficient plot data on which to build yield curves. Empiric yield curves were generated for unmanaged conifer stands for the average site index of each SYU.

Future Yield Projections

Future yields for managed stands were projected using the System-1 young stand model (Ticknor et al, 1989) and the SW-Organon growth and yield model (Hester et al, 1989). System-1 was used to generate tree lists representing current and expected future even-aged young plantations resulting from clearcut type harvests. These tree lists were grown in System-1 up to age 15, exported to Organon and simulations continued. Organon was used to project older existing plantation conditions under different silvicultural prescriptions. Organon was also used to estimate older stand development and yields for

currently unmanaged stands and future managed stands subject to partial cut harvests. These partial cut yield projections are used in alternative C and the Connectivity/Diversity Block land allocations of the PRMP.

System-1 is an individual tree, distance-independent growth model suitable for growing trees from a minimum of three years of age up to a size compatible with entry into growth models suitable for older stands such as Organon. It was developed by U.S. Forest Service, Pacific Southwest Experiment Station from sampling plots located in the major forest types of northern California and southern Oregon. Conifer trees can be grown with or without simulated competition from herbaceous, shrub and hardwood competition. A direct output link is supplied from System to Organon.

SW-Organon is an individual tree, distance-independent growth and yield model. It was developed by Oregon State University from sampling plots located in the mixed conifer zone of southwestern Oregon. The Organon growth and yield model is designed primarily to simulate the growth and timber yield of Douglas-fir and mixed conifer stands. The model was designed to allow projections of both even-aged and uneven-aged stand conditions under different treatment prescriptions. Prescriptions modelled can include precommercial thinning, commercial thinning, fertilization and different regeneration harvest scenarios alone or in various combinations. Tree lists reflecting a variety of different stand conditions are used as a starting point for simulation. Sources of tree lists for simulation of yields in the different alternatives were the district's Continuous Forest Inventory (CFI) plots and special stand exams. The versions of Organon used for yield simulation incorporate BLM's own volume equations and merchantability standards.

All Organon yield outputs are gross volumes. Net volumes available for harvest were calculated by reducing gross volumes for factors such as stocking irregularity, insects and disease, defect and breakage and retention of overstory trees where applicable. Alternatives C and PRMP incorporate an additional mortality factor of 2.8 percent per decade for larger trees beginning at age 100. This additional mortality is to account for non-suppression related mortality caused by pathogens and wind as the stand ages.

Projections of future yields of young managed stands were done using tree lists that represent the average condition for a grouping of stands which are similar in condition. CFI plots for existing young even-aged managed stands were grouped by existing stand

condition (ESC). The stands were projected forward in Organon and yields compared at ages 50 and 100. Ages 50 and 100 were used as the probable range of rotation ages for even-age stands in most of the alternatives. The plot with yields that was closest to the average yield of all plots in an ESC at both age 50 and 100 was used to simulate the silviculture prescriptions to be applied to that ESC. Tree lists for simulating future even-aged stands resulting from harvest utilized average conditions such as tree heights, diameters and species composition of the current five and 10 year old plantations. Tree lists were generated in the System-1 young stand model using these average characteristics, grown to age 15 and exported to Organon for further simulation.

Modelling of partial cut and uneven-aged silvicultural prescriptions required a further subdivision of stand groupings for the existing unmanaged stands. Each CFI plot tree list was input into Organon and both tabular and graphical outputs of current plot characteristics were produced. Plots with an ESC of no past management (ESC 40) were categorized based on like characteristics such as similarity of stand structure, number of large trees, range of volumes, hardwood component etc. Other ESC's with small acreages were lumped in with ESC 40. Silvicultural prescriptions were simulated using all CFI plots in a group. Plots within a group were projected into the future using the same prescriptions. Results of all simulations within a group were averaged together and used to represent the average yield for each group. These stand groupings were used in simulations for Alternative C and PRMP. The PRMP also utilizes the existing managed plantations groupings described previously.

Gains from genetic tree improvement were calculated from progeny test site data. To incorporate gains from genetics, the site index for silvicultural prescriptions including genetically improved seedlings was raised to correlate with expected height gain at age 15. Gains were reduced to account only for the improvement of Douglas-fir in mixed species stands.

Allowable Cut Effect (ACE)

Allowable Cut Effect (ACE) - The immediate increase in the current Allowable Sale Quantity (ASQ) which is justified by expected future increases in yields due to present or proposed management treatments."

The Allowable Cut Effect (ACE) may be produced if future growth rates exceed current growth rates. As the long term average growth rate increases, volume produced between the current and average growth rate may be scheduled for harvest. That portion of an ASQ attributed to yields from increasing growth rates is the ACE. ASQ refers to a non-declining sustainable even-flow timber harvest over a long period of time.

Any silvicultural practice or management policy which affects implementation of practices, including harvest scheduling constraints, that increases or decreases the forest's average volume growth increment (growth rates) affects the potential sustainable harvest level. Harvesting stands with a slow growth rate compared to their site potential (usually mature stands which have a declining net growth rate) and replacing them with faster growing stands will, over a period of a few decades, increase the forests' average growth rate.

On a stand by stand basis, increasing growth rates are usually associated with silvicultural practices such as precommercial/commercial thinning, fertilization, or planting genetically-selected seedlings. Combinations of these silvicultural practices may increase harvestable stand volumes by 10 to 25 percent. Those treated stands can provide opportunities for commercial thinning or earlier regeneration harvest.

Management for non-timber values such as wildlife habitat enhancement have a wide range of effects on growth rates. Retention of late-successional stands, or conversion of fast growing stands to mature or late-successional stage stands, reduce current forest growth rates.

ACE may be influenced by silvicultural practices that extend the period of maximum growth rates in natural or managed stands. Practices such as thinning can delay culmination of mean annual increment (CMAI). The net effect is to maintain stands with high growth rates within the range of maximum value for longer periods. These conditions may balance out, maintain or slightly increase forest growth rates.

Realizing harvests that include the "ACE effect" is dependent on a number of factors besides growth rates. The ASQ is sensitive to a number of factors which include: existing stand conditions, age-size class distributions, land use allocations, wildlife habitat needs, management rules on proximity of harvest units, minimum harvest age, harvest scheduling restrictions, and the extent of investments in growth enhancing practices. The potential ACE

Selection of Harvest Scheduling Model and Allowable Sale Quantity Calculation Process

occurs only to the extent that all such factors, when applied in concert, allow contributions to ASQ from increases in future forest growth rates.

ASQ sensitivity tests were made to determine how much of the current ASQ might be attributed to various levels of growth enhancing practices such as precommercial thinning, fertilization and planting genetically-selected seedlings. Current forest conditions often limited ACE although future average

forest growth rates were increased. An ACE effect was generally found where the slower growing (mature) stands were converted to faster growing stands. When factors affecting 10 to 50 year stands such as their landscape locations, land use restrictions, or age-size class distribution cause a harvest volume gap, no ACE is possible for this decade. Likewise first or early decade harvesting of only stands growing at near maximum growth rates does not produce a measurable ACE.

Appendix L

Silvicultural Systems and Harvest Methods

This appendix describes the silvicultural practices and systems planned for use in implementation of the Proposed Resource Management Plan (PRMP).

Silvicultural systems define the sequence of management treatments that take place throughout the entire lives of forest stands that are conducted to meet management objectives. Systems are usually differentiated by the reproduction method or regeneration harvest method employed, e.g. clearcut, seed tree, selection etc. Systems are designed to move stands from their current condition along a developmental path toward a desired, or target stand condition. Reforestation or the establishment of desired vegetation is the critical part of any silvicultural system.

In the design of the proposed action, a variety of general silvicultural systems are used for the different Land Use Allocations. Differences between systems are the result of differences in resource objectives and differences in forest condition and ecological types. Silvicultural systems are resource and objective neutral. They are designed to meet a wide range of management goals that include timber production, creation or maintenance of wildlife habitat, restoration of forest condition (health), restoration or improvement of riparian condition, and maintenance of site productivity. The description of silvicultural systems, therefore, is not limited to any one resource category. Within each system there is variation in the timing of and type of stand treatments depending on stand condition and other factors.

Silvicultural System Design

Silvicultural systems as well as individual management actions will be designed and used to:

1. Meet established land use objectives.
2. Maintain the health and sustainability of forest ecosystems and their processes or to restore forest condition so that management objectives can be met.

3. Incorporate current and developing knowledge of natural processes and the relationships between structures, landscape arrangements, and the maintenance of ecosystem function.
4. Involve landscape level (watershed) analysis at a variety of spatial and temporal scales.
5. Consider the elements of ecosystem and landscape function, composition, and structure.

Silvicultural system design will vary from site to site and will be based on:

1. Consideration of stand vigor, disease, live crown ratio, and general stand condition.
2. The autecological and synecological requirements of major or indicator plant and animal species and species groups.
3. Habitat requirements of rare or endangered species.
4. Requirements of avoidance strategies for vegetation management.
5. Economic feasibility.
6. Soil, slope, aspect, and other physical site conditions that influence reforestation potential, blowdown potential, or that otherwise influence the ability of prescribed treatments to meet target stand and landscape objectives.

Simply stated, silvicultural systems and actions should be based on the objectives of the land allocation, ecological processes, site and stand characteristics, and economic feasibility within a framework of landscape analysis.

Silvicultural Systems Proposed for the PRMP

The silvicultural systems proposed for the Roseburg District are modifications of even aged systems. Modified even aged systems involve the management of both existing even aged or near even

aged stands and the creation of new even aged stands through harvesting while retaining both living and dead structural elements i.e. “biological legacies”. Biological legacies include; green trees, snags, and coarse woody debris.

Stand regeneration methods under modified even aged silvicultural systems include variations of the reserve seed-tree and irregular shelterwood harvest methods (Smith 1962). The modifications of these systems are one of differing objectives, though there may not be an apparent difference in appearance. For example, green tree retention following a traditional system is done for seed production and additional volume/value increment. Green trees retained using the proposed modified systems are for the primary purpose of providing present and future wildlife habitat components.

Stand Regeneration

The proposed modified reserve seed-tree method of harvest removes the majority of a stand in a single entry except for a small number of green trees; six to eight conifer trees per acre. In addition desired coarse woody debris and snags are retained to meet management objectives. Regeneration is usually achieved through planting following site preparation, although advanced regeneration may be present subsequent to harvest. Natural regeneration may occur through seed dispersed from retention trees or adjacent timber stands, although there is potential for regeneration delay from reliance on natural seeding alone. Genetically selected stock would be used when available. Units harvested in this manner could require actions in addition to conifer planting to secure regeneration. These practices include seedling shading, protection from animal damage, and control of competing vegetation.

The proposed modified irregular shelterwood system removes the majority of a stand in a single entry except for a number of green trees; 12-18 conifer trees per acre that are retained. In addition desired coarse woody debris and snags are retained to meet management objectives. Regeneration is usually through planting following site preparation, although advanced regeneration may be present subsequent to harvest. Natural regeneration may occur through seed dispersed from retention trees or adjacent timber stands. There is greater potential for natural regeneration using this system compared to the reserve seed-tree system. Areas harvested in this manner could require actions in addition to conifer planting to secure regeneration. These practices

include some or all of the actions described for the reserve seed-tree system.

Stand Management

Following the regeneration phase, modified even aged systems are subjected to treatments designed to produce desired stand conditions that include wood of desired quality, quantity, and value. Modified even aged systems may be managed at different levels of intensity.

Stand management practice include control of species composition and stand density. Release practices are employed to ensure tree growth is not slowed by competing, undesirable plants and that desired trees are not displaced. Density control through thinning assures that cubic foot volume growth is concentrated in the stems of selected trees.

Forest fertilization may be employed to temporarily increase stand growth. Some young stands in the planning area are in poor condition because of high densities or because of overstory competition. Stands may experience significant growth retardation called thinning shock following precommercial thinning, overstory removal, or release. The severity of this retardation may be reduced through the application of fertilizer. Forest fertilization may also be used to improve tree vigor and to reduce insect and drought related mortality.

Stand Harvesting

Stand harvesting may occur at any age above a minimum harvest age set to meet land use objectives as well as economic and logging practicality requirements.

The sustainable harvest level is highest if minimum harvest age is set at the lowest practical age. Over time, however, rotation lengths would approach the age of culmination of mean annual increment (CMAI). CMAI varies with site quality, the kinds of silvicultural practices employed, and the timing of those practices. For most silvicultural regimes and sites on the Roseburg District CMAI occurs from about 80-110 years of age.

Silvicultural Practices

For each silvicultural system a variety of practices, other than harvesting, may be planned for specific periods in the life of the stand. These practices act to keep forest stands on desired developmental trajectories, speed the development of desired habitat components, and maintain or improve stand vigor. Silvicultural practices in this region have traditionally been applied to conifer stands and their development, however, many of the same principles and treatments have application for the growth and development of other desired vegetation.

While both the types of practices used and timing vary between systems, most silvicultural systems require the full range of forest management tools and practices for their successful implementation. To predictably direct forest stands (ecosystems) so that structural and other objectives are met may require some level of intensive stand tending practices whatever the system employed. Further information on silvicultural practices is located in Appendix N; "Relationship of Silvicultural Practices and Silvicultural Systems on Wood Quality, Timber Yields, and Economic Value."

Site Preparation

If needed, site preparation procedures would be used to prepare newly harvested or inadequately stocked areas for planting, seeding, or natural regeneration. Site preparation methods would be selected to: provide physical access to planting sites; control fire hazard; provide initial physical control of the site to channel limited resources on the site into desired vegetation; influence the plant community that redevelops on the site; influence or control animal populations; and ensure the retention of site productivity.

Within the planning area, four types of site preparation techniques would be used. These are prescribed burning, mechanical and manual methods, and herbicide application.

Prescribed burning, including broadcast and pile burns, is expected to be the primary method of site preparation. To protect air quality, burning would occur under conditions consistent with the Oregon Smoke Management Plan. Broadcast burning prescriptions will be written to minimize the detrimental effects of fire on other resources. Emphasis will be placed on protecting soils properties

and the retention of coarse woody debris. Prescribed fire on sensitive soils will be designed to result in low to moderate intensity burns.

Mechanical site preparation consists of either: tractor piling or windrowing of slash and unwanted vegetation; or the use of a low ground pressure backhoe, loader, grapple, or other special equipment to move or pile slash and unwanted vegetation.

Manual site preparation consists of shrub pulling or cutting and hoeing or grubbing of unwanted vegetation and slash.

Application of herbicides for site preparation purposes would occur only after careful site-specific environmental analysis and local public involvement. Decision for use would be governed by the procedures established in BLM's Record of Decision, Western Oregon Program Management of Competing Vegetation.

Regeneration

Conifer planting would be done where appropriate to assure that reforestation objectives are promptly met. The production of planting stock requires seed (cone) collection from wild stands and/or from seed orchards and the production of planting stock in bare root nurseries or container shadehouses.

The release and management of existing natural regeneration has the potential to speed stand development. Natural regeneration can, in many situations, be both adequate and relatively prompt and of appropriate species. A result of relying on natural regeneration is the loss of the ability to use genetically selected stock. When applicable, silvicultural systems would utilize existing regeneration, natural seeding, and prompt planting of desired species to assure that regeneration targets and timeframes are met.

Existing vegetation would be used to the extent possible in meeting management objectives that are dependent upon nonconifer vegetation. Where necessary to meet objectives, nonconifer vegetation would be established through seeding or the planting of bare root or containerized plants.

Stand Protection

Stand protection procedures would be designed to protect newly planted conifer seedlings and in some cases natural seedlings from natural hazards. Treatments include but are not limited to protecting seedlings from the sun by shading and placing plastic tubes/netting over seedlings to protect from animal browsing. Control measures to deal with populations of animals such as mountain beaver, gophers, or porcupines would be initiated if populations of these animals reached levels high enough to threaten stands. Treatment acres will be determined annually in conjunction with reforestation surveys.

Similar treatments would be used when appropriate to protect planted or seeded nonconifer vegetation.

Stands will also be managed to decrease the risk of destruction by wildfire. Management practices include treatments such as underburning, limbing, density management, or hand piling or utilization of slash.

Stand Maintenance

Maintenance treatments occur after planting or seeding and are designed to promote the survival and establishment of conifers and other vegetation by reducing competition from undesired plant species. Maintenance and other vegetation management actions would be planned to meet species diversity goals.

Maintenance actions involve the implementation of preventive or ecosystem based strategies or direct control actions using techniques such as mulching, cutting or pulling of unwanted species, grazing, or herbicide application. As with other vegetation management treatments, preference for stand maintenance treatments would be given to strategies that redirect natural ecosystem processes where practical and where scientific knowledge was adequate to support such strategies. The choice between methods would be made under the same decision framework listed for site preparation.

Precommercial Thinning and Release

Precommercial thinning and release treatments would be designed to control stand density, influence species dominance, maintain stand vigor, and place

stands on developmental paths so that desired stand characteristics result in the future. Thinning and release may occur simultaneously or separately.

Precommercial thinning and release treatments may be done either by manual methods such as falling and girdling or through herbicide application. Site specific decision making processes for herbicide release treatments follow the same procedures as those listed for site preparation.

Commercial Thinning (Density Management)

Commercial thinnings would be designed to control stand density, maintain stand vigor, and place or maintain stands on developmental paths so that desired stand characteristics result in the future. Commercial thinnings are scheduled after developing stands reach a combination of stem diameter and surplus volume to permit an entry that is economical.

Fertilization

Stand growth is limited by the supply of available nutrients, particularly by available nitrogen. The supply of soil nutrients would be conserved through design of management actions and could be augmented through either fertilization or in some situations, through retention of species and structural diversity in stands. Fertilization actions are usually designed to apply 200 pounds of available nitrogen with helicopters in the form of urea based prill (46 percent available nitrogen). Occasionally, fertilizer may be applied in a liquid urea-ammonia form or with a mixture of other nutrient elements in addition to nitrogen. Hand application is usually impractical.

Pruning

Pruning of young stands is carried out to increase wood quality through the production of clear wood on rotations shorter than would be required without the action.

Pruning appears to be necessary to produce wood of acceptable quality from stands that are managed at very low densities to meet biological diversity objectives since trees in such stands would have long crowns and would produce wood with large knots without the action.

Underburning

Use of fire for the specific purpose of hazard reduction, reducing mortality of desired trees and improving stand vigor, resiliency, and stability.

Where appropriate, silvicultural systems and individual management actions will be adapted to meet the requirements of experimental designs that permit the agency and its publics to explore the results of the application of a range of alternative management options to both stands and landscapes. Where not in direct conflict with Land Use Allocation objectives, silvicultural systems would be designed to assure that resultant wood quality is suitable for the range of current and forecasted uses and that they would maintain or enhance log value.

Objectives, Habitat Criteria, and Management Practices Design for the Land Use Allocations

The description of the proposed action involves three separate criteria for each Land Use Allocation. These criteria are:

1. Resource condition objectives that summarize and highlight the important resource management goals for the Land Use Allocation for the next decade.
2. Stand and landscape condition objectives that are desired in the near future and in the longer run.
3. Management direction which sets sideboards and standards for stand and landscape composition.

Management direction described in this appendix incorporates "Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl."

Matrix

General Forest Management Area

The general prescription would be one of modified even aged management primarily employing the modified reserve seed-tree system. Silvicultural practices include the full range of practices consistent with Land Use Allocation objectives.

A. Resource Condition Objectives

1. **Commodity Production:** Suitable commercial forest land would be managed to assure a high level of sustained timber productivity. Emphasis would be placed on use of intensive forest management practices and investments to maintain a high level of sustainable resource production while maintaining long-term site productivity, biological legacies, and a biologically diverse forest matrix.
2. **Forest Condition (Forest Health):** A very small and very limited acreage of stands in this allocation may not be in a condition to respond to treatments designed to meet management objectives. Management actions to improve forest condition include density management and understory reduction operations that reduce competition, increased use of understory prescribed fire, and fertilization.
3. **Habitat Retention, Restoration, and Production:** Selection of stands for management will involve consideration of the desired blend of seral stages and stand densities. Manage landscape planning blocks to maintain desired levels and distribution of early seral vegetation.

B. Stand and Landscape Condition Objectives

1. **Target Stand Conditions:** Manage forests of the Land Use Allocation so that over time landscapes would trend toward a forest composed of stands containing a variety of structures; stands containing trees of varying age and size, and stands with an assortment of canopy configurations. As stands age, within stand conditions should trend toward those characteristic of older forest types.

Appendix L

2. **Seral Composition:** Over time, manage for a balance of seral stages consistent with Land Use Allocation objectives.
 3. **Landscape Composition:** Manage toward a mix of stand conditions and seral patterns with consideration to three levels of scale: physiographic province (river basin / mountain range), landscape block (watershed), and within stand detail.
- C. **Management Direction for program implementation**
1. **Variation by ecological type:** Planning and implementation of specific projects will be based on an understanding of the ecological relationships and limitations of the communities proposed for management.
 2. **Qualifications of stands for management deferral:** Stands whose current level of large green trees do not meet retention objectives would not be scheduled for regeneration harvests or overstory removals that removed those trees. Understory thinning and salvage of volume from these stands following partial or complete stand mortality would be permitted provided structural objectives were met.
 3. **Stand Structural and Species Composition:**

Structural Composition: Maintain site productivity and wildlife habitat values through the retention of structure and the design of practices required to maintain ecosystem processes throughout the management cycle. Retain on the average six to eight large green trees per acre in harvest units. Large conifers reserved would proportionally represent the total range of tree size classes greater than 20 inches in diameter and would represent all conifer species present. Entries into younger stands would reserve the largest six to eight trees. For specific Standards and Guidelines on coarse woody debris, green tree, and snag retention refer to pages C-40 through C-44 of the Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl.

Species Composition: Manage so that tree species trend over time toward average species compositions consists of approximately 89 percent Douglas-fir, five percent pines, four percent grand fir, and two percent other conifers. Manage shrubs, forbs, and other vegetation consistent with Land Use Allocation objectives.
4. **Landscape Design Elements:** Situate harvest units to meet general landscape objectives on three levels of scale: physiographic province, landscape block or watershed, and the stand.
 5. **Regeneration harvests:** Regeneration harvests would not be programmed for stands under 60 years of age with long term rotation age programmed for culmination of mean annual increment (CMAI). CMAI is between 80-110 years on the average for proposed silvicultural systems. Priority for harvest in stands under 80 years of age would be commercial thinning. Practices will be strongly influenced by consideration of ecological site potential and operability factors.
 6. **Commercial Thinning and other Density Management:** Stand densities would be maintained within desired ranges through a combination of planting density, precommercial thinning, commercial thinning, and management of fine grained stand detail. Commercial thinning entries would be programmed for stands under 80 years of age. Thinnings would usually be designed to assure high levels of volume productivity. Units will retain patches of denser habitat where desired to meet wildlife habitat criteria.
 7. **Activity Scheduling:** Stand treatment priority would result from the watershed analysis process.
 8. **Disease Management:** Design silvicultural treatments so that within stand endemic levels of tree disease do not increase and so that, where possible, infected trees contribute to the achievement of Land Use Allocation objectives. Creation of snags over time as a root rot center expanded would be an example of using tree disease to meet a structural objective. Mistletoe infected trees should be located in topographic positions that are not conducive to the spread of the disease.

9. Forest Condition (Forest Health) Restoration: Priority for restoration treatments will be determined at the stand level and will be based on the stand's ability to meet management objectives in the long-term.

landscape planning analysis. Manage toward a mix of stand conditions and seral patterns with consideration to three levels of scale: physiographic province (river basin / mountain range), landscape block (watershed), and within stand detail.

Connectivity/Diversity Blocks

The general prescription would be one of modified even aged management primarily employing the modified irregular shelterwood system. Silvicultural practices include the full range of practices consistent with Land Use Allocation objectives.

A. Resource Condition Objectives

1. Connectivity and Diversity: Manage to provide ecotypic richness and diversity and to provide for habitat connectivity for old-growth dependent and associated species within the General Forest Management Area. Manage to maintain a minimum of 25 percent of each block in late successional condition both long-term and short term. Late-successional stands within riparian reserves and other allocations contribute toward this percentage. Minimize fragmentation of interior habitat within block and in adjacent older stands to provide as effective habitat as possible.
2. Commodity Production: Suitable commercial forest land within blocks would be managed to assure a moderately high level of sustained timber production.

B. Stand and Landscape Condition Objectives

1. Target Stand Conditions: Manage forests of the Land Use Allocation so that over time landscapes would trend toward a forest composed of stands containing a variety of structures, stands containing trees of varying age and size, and stands with an assortment of canopy configurations. As stands age, within stand conditions should trend toward those characteristic of older forest types.
2. Seral Composition: Over time, manage for a minimum of 25 percent late-successional condition in each block.
3. Landscape Composition: Incorporate Connectivity/Diversity Blocks within

C. Management Direction for program implementation

1. Variation by ecological type: Planning and implementation of specific projects will be based on an understanding of the ecological relationships and limitations of the communities proposed for management.
2. Qualifications of stands for management deferral: Stands whose current level of large green trees do not meet retention objectives would not be scheduled for regeneration harvests or overstory removals that removed the large trees. Understory thinning and salvage of volume from these stands following partial or complete stand mortality would be permitted provided structural objectives were met. Manage so that best ecologically functioning stands would be seldom entered in the short term.
3. Stand Structural and Species Composition:

Structural Composition: Maintain site productivity and wildlife habitat values through the retention of structure and the design of practices required to maintain ecosystem processes throughout the management cycle. Retain on the average 12-18 large green trees per acre in harvest units. Large conifers reserved would proportionally represent the total range of tree size classes greater than 20 inches in diameter and would represent all conifer species present. Entries into younger stands would reserve the largest 12-18 trees. For specific Standards and Guidelines on coarse woody debris, green tree, and snag retention refer to pages C-40 through C-44 of the Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl. In addition, a minimum of two large hardwoods, if present would be left per acre. Logging safety and potential tree mortality would be considered when determining the distribution of retention trees and snags.

Species Composition: Manage so that tree species trend over time toward average percent species composition of 78 percent Douglas fir, four percent pines, two percent Grand fir, 12 percent other conifers, and four percent hardwood. Manage shrubs, forbs, and other vegetation consistent with Land Use Allocation objectives.

4. Landscape Design Elements: Situate harvest units to meet general landscape objectives on three levels of scale: physiographic province, landscape block or watershed and the stand. Harvest unit shapes would be constrained by economic practicality and logging system capabilities. Retain dead and green structure consistent with meeting long term stand composition goals. Situate harvest units to meet general landscape objectives, including minimizing fragmentation, and providing general landscape connectivity. Harvest methods could vary within stand to: a) reflect current within stand spatial patterns, b) as required to meet stand objectives, and c) to retain or create patches of reproductive or other habitat for key wildlife species.
5. Regeneration harvests: Regeneration harvests would not be programmed for stands under 100 years of age. Priority for harvest in stands under 120 years of age would be commercial thinning. Blocks would be managed using a 150 year area control rotation.
6. Commercial Thinning and other Density Management: Stand densities would be maintained within desired ranges through a combination of planting density, precommercial thinning, commercial thinning, and management of fine-grained stand detail. Commercial thinning entries would be programmed for stands under 120 years of age. Thinnings would usually be designed to assure high levels of volume productivity. Units will retain patches of denser habitat where desired to meet wildlife habitat criteria.
7. Activity Scheduling: Stand treatment priorities for the next decade would be dictated by stand conditions, habitat requirements, and fuel hazard.

8. Disease Management: Design silvicultural treatments so that within stand endemic levels of tree disease do not increase and so that, where possible, infected trees contribute to the achievement of Land Use Allocation objectives. Creation of snags over time as a root rot center expanded would be an example of using tree disease to meet a structural objective. Mistletoe infected trees should be located in topographic positions that are not conducive to the spread of the disease.

Late-Successional Reserves

Late-Successional Reserves would be managed to protect and enhance conditions of late-successional and old-growth forest ecosystems, which serve as habitat for the northern spotted owl and other late-successional and old-growth related species. Silvicultural practices and salvage should therefore be guided by the objective of maintaining adequate amounts of suitable habitat.

Silvicultural practices within reserves would be limited to those practices beneficial to the creation of late-successional forest conditions and would include reforestation, maintenance and protection of existing young stands, density management, and fertilization. In addition to practices that put or maintained stands on desired developmental pathways, practices designed to restore forest condition (forest health) and other practices designed to reduce the risks of stand loss would be done to maintain long-term habitat viability.

“While risk reduction efforts should generally be focused on young stands, activities in older stands may be appropriate if: (1) the proposed management activities will clearly result in greater assurance of long-term maintenance of habitat, (2) the activities are clearly needed to reduce risks, and (3) the activities will not prevent the Late-Successional Reserves from playing an effective role in the objectives for which they were established.” (“Guidelines to Reduce Risks of Large-Scale Disturbance,” page C-13, Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl).

Salvage of mortality volume is limited to stand replacing disturbance events exceeding ten acres under standards outlined under "Guidelines for Salvage," page C-13, Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl.

Riparian Reserves

Silvicultural activities within Riparian Reserves will be designed to meet the objectives of the Aquatic Conservation Strategy. Generally, standards and guidelines prohibit or regulate activities in the reserves that retard or prevent attainment of Strategy objectives. Silvicultural practices would be applied within the reserves to control stocking, to reestablish and manage stands, to establish and manage desired nonconifer vegetation, and to acquire desired vegetation characteristics needed to attain objectives of the Aquatic Conservation Strategy. Forest condition (forest health) restoration would be done where required to attain objectives of the Aquatic Conservation Strategy.

Salvage operations would be done only when watershed analysis determines that present and future coarse woody debris needs are met and other Aquatic Conservation Strategy objectives are not adversely affected. Conduct salvage and fuelwood cutting if required to attain Aquatic Conservation Strategy objectives where catastrophic events such as fire, flooding, volcanic, wind, or insect damage have resulted in degraded riparian conditions.

Adaptive Management Areas

Standards and guidelines for matrix management provide specific measures for coarse woody debris,

and for green tree and snag retention. The intent of these measures must also be met in Adaptive Management Areas, however specific standards and guidelines are not prescribed for these areas.

Riparian Reserves within Adaptive Management Areas: Riparian protection in Adaptive Management Areas should be comparable to that prescribed for other federal land areas.

Other Allocations

Silvicultural practices where appropriate would be designed to be consistent with the objectives of the allocation.

Research

A variety of wildlife and other research activities may be ongoing, currently proposed, or proposed in the future in all land allocations. Provided certain requirements are satisfied, ongoing research may continue and new research may begin. For a discussion of research requirements see, "Research" page C-4, under "Standards and Guidelines Common to all Land Allocations" in Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl. Research discussions can also be found under some of the individual allocations.

References:

Smith, David M. 1962. *The Practice of Silviculture*

Appendix M

Forest Genetics Program

Introduction

For thousands of years humans have selected and used the genetic variation which is naturally present in plants and animals. Genetic diversity is the foundation for plant and animal improvement programs. Modern crop and livestock improvement programs have substantially increased yields and productivity with selection and breeding. The need for food production and natural resources is increasing as the human population increases. Genetic improvement programs have and will continue to help meet these demands.

The genes in all organisms are the basis of their diversity. Genetic diversity is a key component of an ecosystem. Broad genetic diversity is considered to be an asset because variability is a buffer against change. Problems can occur when genetic diversity is too narrow. Genetic uniformity decreases resilience to change and increases the potential for problems due to pests and diseases. Environmental conditions influence the expression of the genetic code. The physical characteristics of an organism is dependent on the interaction of it's genes with the environment. Ecosystems are dynamic communities which change over time and plants and animals are impacted by the changes. Species with wide tolerances can adapt to changes, while those with narrow tolerances can be heavily impacted.

The amount and pattern of genetic diversity in a species develops in part as an organism responds to the environment. This adaptation occurs over a long period of time as the environmental conditions select for or against specific genetic traits. Each species has a unique genetic structure. Genetic studies are conducted to describe and quantify the amount of genetic variation within a species. This information is necessary to direct management and to help guide operational projects.

Genetic diversity can be described as a natural resource. Management and conservation of genetic resources is vital for many reasons. Genetic improvement programs are a great benefit to society and genetic materials have a large economic value. Genetic material from wild stock is an important source of variability which can be infused into existing improved varieties. Many medicinal compounds are derived from plants and there is the potential for more undiscovered uses. Conserving genetic diversity for all species allows evolutionary processes to continue within the conditions of the natural environment.

Tree improvement is the application of genetic principles and methods to forest trees. Many of the desirable traits in trees can be enhanced with tree improvement. The Bureau of Land Management has participated in cooperative tree improvement programs for forest trees in the Pacific Northwest since the late 1950s. The emphasis to date has been in improvement of growth and disease resistance. Ecosystem management principles are changing the focus of the tree improvement program. The existing tree improvement and seed orchard programs will be integrated into a broader based forest genetics program. Genetic diversity issues for many organisms will likely become more important in the future. A forest genetics program is consistent with ecosystem management principles and can be expanded to cover the genetics of other plants and animals.

This appendix describes the objectives of the forest genetics program, the present status, and proposed direction. Readers who are interested in technical details of the tree improvement program are referred to the BLM Western Oregon Tree Improvement Plan (1987) and the BLM Eugene District Tree Improvement Plan (1994). Additional information on genetic resource issues can be found in *The Value Of Genetic Resources* (Oldfield 1984) and *Genetics and Conservation Of Rare Plants* (Falk, Holsinger 1991).

Program Objectives

The objectives of the forest genetics program underlay a broad spectrum of land management activities. The biological foundation of ecosystem management rests upon a clear understanding of the genetic diversity present within the system. The following objectives are broadly defined and include tree improvement, gene management, and gene conservation activities.

- Provide for seed production as needed for planting species on BLM-managed lands. Develop seed collection and seed deployment guidelines as needed.
- Develop genetically improved materials as needed to meet BLM's resource management objectives.
- Maintain and restore the genetic diversity within managed forest stands.
- Analyze needs and implement gene conservation strategies as appropriate.
- Collect information on genetic variation from important species.
- Contribute to the development of genetic information needed for landscape analysis, ecological assessments, research studies, and ecosystem management projects.
- Maintain flexibility within the program so that information fulfills the current needs and anticipates future needs.

Status of the Existing Program

The BLM tree improvement program has generated a substantial and important genetic information base for several conifer species. The data is significant to ecosystem management because it describes the nature and extent of genetic variation present for traits of the species.

Tree improvement programs function at a landscape level. Genetic diversity is continuous across the landscape and tree improvement programs are implemented at this level. Each program is a small ecologically similar area called a breeding unit. Most tree improvement programs are cooperatives with BLM and adjacent land owners. A cooperative

structure is beneficial because it greatly increases the number of trees in the genetic base and the trees are located across a broader geographic area. Program costs are shared among cooperators which is more efficient. BLM is cooperating in more than fifty breeding units which include several million acres of forest land in Western Oregon.

The following accomplishments summarize the status of the program.

- Several conifer species (Douglas-fir, western white pine, sugar pine) have been selected for genetically controlled characteristics such as growth rate, tree form, and resistance to disease.
- Field tests have been established using progeny of the selected trees. These progeny test sites have been measured at regular intervals.
- Seed orchards have been established using parent trees. The orchards are producing locally adapted seed for several major species (Douglas-fir, western hemlock, western red cedar, ponderosa pine, grand fir, incense cedar).
- Each year improved seed is sown for replanting a portion of the harvested forest acres.
- The seed orchards are managed for seed production. Stimulation techniques are part of the management to encourage cone production. Trees which have slow growth in field tests or show undesirable characteristics are removed from the orchard. This practice is known as "roguing".
- Second generation programs have been initiated in some breeding units. Selection and breeding work is underway.
- Facilities for cone and seed processing and greenhouses for growing custom tailored lots of many species are located at the seed orchards.

Proposed Program Direction

The future forest genetics program will be more complex under ecosystem management than under the previous management plans. Improvement of growth and disease resistance will continue as an important component of the forest genetics program. Gene conservation and gene resources management issues will be emphasized to a greater degree. Gene

conservation is specific actions taken to conserve the genetic variation of a species. The purpose is to maintain the range of natural diversity within the species. Gene management is the integration of genetic principals into resource management actions. Ecosystems are complex and genetic diversity is important for all organisms. Genetic principles must be considered when planning and implementing resource management projects so that genetic diversity is maintained.

The following is a summary of the direction for the forest genetics program.

- Progeny test sites will be maintained and measurements of growth and other characteristics will continue. Long term management plans for the sites will be developed.
- Seed orchards will be maintained and managed to produce seed as needed for ecosystem management projects.
- Improved stock will be planted on a portion of the harvested acres.
- Tree improvement programs have emphasized cooperative efforts for operational programs and research studies with state, private, and other government agencies. These partnerships will continue.

- Genetic expertise and genetically appropriate guidelines will be provided for ecosystem management implementation.
- A forest genetic plan will be prepared. It will include a strategy for gene conservation, maintenance of genetic diversity and definition of a monitoring baseline to quantify genetic variation.

Ecosystem management concepts have challenged the forest genetics program with more issues than was done by the previous forest management plans. The former program must be meshed with the additional needs defined by ecosystem management so previous gains are maintained and future needs are addressed. Policy and land use allocations will likely change over time. A flexible broad based forest genetics program is the best option to accommodate changing conditions. Tree improvement, gene management, and gene conservation objectives share a common genetic basis. Each aspect of the program can compliment the others. All aspects should include provisions for maintaining and enhancing genetic diversity. Tree improvement programs are intensive management practices which can achieve higher productivity and help meet the demand for wood products. Genetic information is needed to support and guide ecosystem management projects. Conservation of genetic diversity is vital to ecosystem health and stability.

Appendix N

Relationship of Silvicultural Practices and Silvicultural Systems on Wood Quality, Timber Yields, and Economic Value

This appendix describes the effects of intensive silvicultural practices on wood quality, timber yield and economic value, alone and sequenced together in silvicultural systems.

A variety of silvicultural practices are employed in the management of forest stands. The Bureau of Land Management (BLM) in western Oregon classifies precommercial thinning, commercial thinning, forest fertilization, and pruning as intensive silvicultural practices. These practices are applied to forest stands to meet management objectives such as controlling species composition, controlling stand density, and promoting growth and/or quality characteristics of selected trees. Intensive practices are usually scheduled in a sequence, i.e. a silvicultural system or prescription over the course of a planned rotation.

Wood quality is defined as the suitability of the material for a particular use and is determined from both the characteristics of trees (tree form, ring width, limbiness, and percent of juvenile wood) and from the physical properties of wood (specific gravity, fibril angle, and permeability). Log or tree size alone does not affect quality, but larger trees generally have more clear (knot free) wood and a smaller portion of the tree in juvenile wood.

Timber yield is defined as the total amount of merchantable wood produced over a rotation that is actually harvested. It is usually measured in cubic feet or board feet. Yields in this appendix are expressed in net cubic foot volumes or change in cubic volume.

Economic value is defined as the monetary worth of individual timber products or the net return on investment for individual practices or sequence of practices. The quantity and quality of timber harvested and the timing of costs and revenues affect economic value.

More details of the unpublished analyses described in this appendix are available from the Roseburg and Medford District offices.

Individual Silvicultural Practices

This section describes the effects of forest management actions on timber yields, wood quality and value in the case of pruning.

Uniformity and rate of growth affect the machinability and appearance of lumber. Rate of growth is a limiting factor in high quality structural grades of lumber. Wood must have no less than four rings per inch to meet the criteria for select structural lumber. Specialty items such as scaffolds, joints, and beams must average more than six rings per inch. However, analysis of past problems with the strength of wood from managed stands has indicated that the problems were caused by the percent of juvenile wood, rather than growth rate. In Douglas-fir, juvenile wood occupies the first 15 to 25 rings. A higher proportion of juvenile wood could be expected for stands managed on short rotations. Effects on timber yield from individual silvicultural practices vary depending on the timing and intensity of treatment whether treatment is solitary or in combination with other practices.

Thinning

Thinning is a silvicultural practice used to meet stand density, species composition and stand diversity objectives. Thinnings conducted prior to the time trees are considered to be of nominal merchantable size are called precommercial thinnings. Thinnings that remove merchantable products are designated commercial thinnings.

The principal effect of precommercial thinning is to permit earlier harvest through development of larger log sizes, increase the percent of stand volume on desired species, create stand densities and size distributions conducive to commercial thinning, or other objectives. Precommercial thinning can permit greater realization of yield benefits from genetic

improvement and forest fertilization by redirecting growth potential to crop trees only. To be fully effective, precommercial thinning must be scheduled at the correct time in a stands development (Reukema 1975). This is usually before growth retardation or stand differentiation occur.

Commercial thinnings are timber harvests scheduled any time after a stand reaches a combination of stem diameter and surplus volume which permit an economical harvest. Commercial thinning can be effective in increasing recoverable timber yields by harvesting trees which would otherwise die prior to the final regeneration harvest in stands as old as 150 years (Williamson and Price 1971) (Williamson 1982). Heavy commercial thinning shows the ability to accelerate the development of old-growth stand characteristics in current even aged stands (Newton and Cole 1987).

For both types of thinning, extremely low post thinning densities can negatively affect wood quality through excessive taper and slope of wood grain and through production of wide growth rings, the primary effect of thinning on wood quality is changes in the limb characteristics of trees. Thinning increases limbiness and lengthens the time dead limbs adhere to the tree. Knots and the distorted wood around them reduce wood strength significantly and the yield of wood graded for appearance (selects and shop grades). Thinning also increases the proportion of younger stems which are in juvenile wood. These effects were described in Maguire et al. (1991). Low post thinning densities can negatively affect timber yield by not maintaining enough trees to take advantage of full site growth capacity in the short term (Curtis and Marshall, 1986).

Fertilization

Fertilizer is applied to forest stands to offset limiting supplies of nutrients in the soil, particularly nitrogen. Fertilization treatments are usually scheduled with thinning treatments and are spaced 10 to 15 years apart.

Fertilization has the effect of accelerating stand development and increasing timber yields (Miller, Clendenen and Bruce 1988). Since fertilizer increases individual tree vigor and the rate tree crowns expand, it has been observed to reduce thinning shock, accelerate release and overcome damage from insects and drought.

Fertilization tends to increase ring width and decrease wood specific gravity by an average of 5 percent (Megraw 1986). However, this is not thought to have a significant effect on wood quality. Fertilization increases piece size significantly. Treatment can be timed to improve the ratio of mature wood to juvenile wood and after pruning to improve the production of clear wood core.

Pruning

Pruning is carried out to improve wood quality through the production of clear wood on rotations shorter than what would be required without the action. Pruning helps to avoid the production of wood with loose knots. Pruning is mandatory to insure the production of significant amounts of clear wood in intensively managed stands of Douglas-fir under normal even aged management and short rotations (Cahill et al 1988) (Fight et al 1988). Pruning may also have benefits in meeting structural diversity objectives and decreasing fire hazard in areas with short natural fire return intervals. Pruning appears to be necessary to produce significant wood of acceptable quality from lower density stands (Briggs and Fight 1992).

A financial analysis of pruning Douglas-fir and ponderosa pine was done by Fight, Bolon and Cahill (1993). Their results showed that pruning for both species would show positive economic returns where and when properly implemented. Future real increases in higher quality product grades were not necessary to achieve positive economic returns.

Pruning can decrease timber yields if a significant portion of the live tree crown is removed (O'Hara 1991). BLM does not propose levels of live crown removal that are likely to impact timber yields. BLM pruning operations are expected to have a neutral effect on timber yields.

Silvicultural Systems

This section summarizes the results of an analysis of timber yield and wood quality effects on economic return for selected silvicultural systems proposed for the PRMP. Silvicultural systems affect wood quality, timber yields, and economic return by changing tree and stand growth patterns and the magnitude of discounted costs and benefits. The silvicultural systems analyzed are representative of management regimes proposed for the next decade on BLM-managed lands classified as Northern General Forest

Silvicultural Systems Analyzed

Management Areas (NGFMA). This single analysis is intended to portray results which reflect average stand conditions and average response to treatments on a statewide basis for BLM managed lands in western Oregon. These silvicultural systems will vary somewhat within and between districts but, are representative enough to display relative effects of similar silvicultural systems.

Effects of the different management practices and combinations are depicted as percent change in timber yield, percent change in net present value (NPV), NPV, benefit cost ratios and value per cunit (100 cubic feet) of timber yield.

Table N-1 describes the various silvicultural systems analyzed. Analysis was limited to silvicultural systems incorporating precommercial thinning, commercial thinning, forest fertilization, and pruning compared to a base prescription which represents an overstocked stand with no treatments until a final regeneration harvest.

Table N-1. Summary of Silvicultural Prescriptions Analyzed

Silvicultural System	Description
BASE	Overstocked (overdense) stand averaging 680 trees per acre at age of establishment. Final regeneration harvest at age 60 or 100.
PCT	Overstocked stand; precommercially thinned at age 12 to 250 trees per acre. Final regeneration harvest at age 60 or 100.
PCT/FERT	Overstocked stand; precommercially thinned at age 12 to 250 trees per acre. Fertilizer applied at ages 30 & 45. Final regeneration harvest at age 60 or 100.
PCT/CT*	Overstocked stand; precommercially thinned at age 12 to 250 trees per acre. Commercial thinning at age 45. Final regeneration harvest at age 60.
	Overstocked stand; precommercially thinned at age 12 to 250 trees per acre. Commercial thinning at ages 45 & 65. Final regeneration harvest at age 100.
PCT/FERT/CT	Overstocked stand; precommercially thinned at age 12 to 250 trees per acre. Fertilizer applied at ages 30 & 45. Commercial thinning at age 45. Final regeneration harvest at age 60.
	Overstocked stand; precommercially thinned at age 12 to 250 trees per acre. Fertilizer applied at ages 30 & 45. Commercial thinning at ages 45 & 60. Final regeneration harvest at age 100.
PCT/PRUNE	Overstocked stand; precommercially thinned at age 12 to 250 trees per acre. Pruned 80 trees/acre at age 25. Final regeneration harvest at age 60 or 100.

* Silvicultural systems with two descriptive approaches are dependent on assumed rotation lengths. Variations in exact timing of practices will vary by district.

Analytical Assumptions:

Following are the specific assumptions made in the analysis.

1. Difference in site productivity can significantly affect yields and financial returns (Koss and Scott 1978). BLM in western Oregon manages twelve planning units designated as Sustained Yield Units (SYU). Site quality is variable both within and between SYU's. Due to the complexity of trying to analyze each SYU separately, the Douglas SYU of the Roseburg District was selected as representative for BLM administered lands in western Oregon. Average productivity expressed as site index for this SYU is 100 using Hann-Scrivani site index curves (Hann and Scrivani, 1987). Site Index 100 is the approximate mid-point of average site indexes used by the westside BLM districts for decadal planning purposes in estimating timber yields.
2. The costs for stand establishment treatments were derived from 1989 Roseburg BLM District contract cost data sources weighted by the percent of acres receiving the treatment. Logging and hauling costs were derived from tabular information compiled by the Medford BLM District for general westside BLM use in feasibility analysis for resource management planning.
3. An inflation rate of zero (0) and no future real increase in wood value was assumed. A discount rate of 4% was used.
4. The costs of establishing the current stand were not included in this analysis. However, the costs of establishing the next stand were included at the end of the assumed rotations. This convention is consistent with economic analyses done previously for BLM planning purposes in western Oregon¹.
5. Comparisons of effects were made at rotation (regeneration harvest) ages of 60 and 100 years depending on silvicultural system. 60 years represents probable average statewide minimum rotation ages for BLM. 100 years represents the probable average BLM rotation age if culmination of mean annual increment is used as the rotation age criteria. (Curtis 1992, Curtis and Marshall 1993).
6. Intangible or intrinsic values (Smith 1987) such as the potential value of practices for meeting nontimber objectives were considered beyond the scope of the analysis.

7. Pruning analysis was performed using the addition of select pricing for lumber grades and veneer market. Pruning of the first 17.5' (16' merchantable log) is assumed to occur at age 25.
8. All gross yield outputs from SWO-Organon were reduced for stocking irregularity, insects and disease, defect and breakage and effects of green tree retention at a level of 7 large conifers per acre.
9. Timber products harvested were assumed to be a mixture of lumber and veneer. Lumber prices used in TreeVal+ were derived by taking 1989 Table 9 figures shown in Warren (1993). TreeVal+ veneer prices were derived from reviewing Random Lengths publications (Nov. 1992 - Aug. 1993). The use of 1993 veneer pricing instead of associated 1989 values was required due to the lack of readily available data sources.

Analytical Models

Future timber yields and wood quality tree characteristic outputs for managed stands were obtained from simulations using the System-1 young stand model, Version 1.8 (Ritchie et al, 1991) and the SWO-Organon growth and yield model Version 4.0 (Hann et al, 1992) .

System-1 is an individual tree, distance independent growth model. It is suitable for growing trees from a minimum of three years of age up to an age (15-20+ years) compatible with entry into growth models suitable for older stands such as SWO-Organon.

SWO-Organon is an individual tree, distance independent growth and yield model. It was developed from sampling plots located in the mixed conifer zone of southwestern Oregon. The model was developed primarily to simulate the growth and timber yield of Douglas-fir and mixed conifer stands. The model was designed to allow projections of both even-aged and uneven-aged stand conditions under different silvicultural systems.

Wood value and economic analysis were analyzed using the TreeVal+ (Sachet et al, 1989), DF Prune (Fight et al, 1992), and Forestry Investment Program (FIP) (Ikaheimo 1990) models. The first two programs provide product recovery plus value data and partial cost data to the third model for an integrated economic analysis.

TreeVal+ is an analysis program which calculates tree or stand values based on predicted product recovery. TreeVal+ is appropriate for natural stands or managed plantations. Values of products harvested under the different regimes simulated were obtained from the TreeVal+ program.

DF Prune is a spreadsheet program designed to estimate the financial return from pruning coast Douglas-fir. Values of products harvested under regimes where pruning is simulated were obtained from the DF Prune program.

The Forestry Investment Program is a financial analysis program specifically developed for the economic evaluation analysis of silvicultural regimes. FIP utilizes data inputs from SWO-Organon, TreeVal,

DF Prune and other sources in calculations of net present values (NPV). The analysis can be structured to account for inflation, cost changes and product value changes over time.

Results of Silvicultural Systems Analysis

Table N-2 and N-3 show the effects on timber yield and economic returns for the different silvicultural systems for rotation ages of 60 and 100 years after stand initiation. Wood quality change is not directly displayed but is expressed in the economic measures.

Table N-2. Comparison of Yield Changes & Economic Returns for a 60 Year Rotation

Silvicultural System	% Change in Cubic Volume	Net Present Value (NPV)	% Change	Benefit/Cost Ratio	Value per CUnit
BASE	*	\$301	*	1.38	\$3.78
PCT	+7%	\$530	+76%	1.68	\$6.21
PCT/FERT	+13%	\$611	+103%	1.72	\$6.78
PCT/CT	+15%	\$497	+65%	1.49	\$5.43
PCT/FERT/CT	+21%	\$677	+125%	1.62	\$7.04
PCT/PRUNE	+7%	\$713	+137%	1.71	\$8.35

Notes:

% change in cubic volume is the increase in volume above that produced by base prescription (overstocked stand condition).

Net present value (NPV) is calculated by subtracting discounted costs from discounted benefits.

% change NPV is the percentage of NPV increase or decrease compared to the NPV of the base prescription.

Benefit cost ratio is calculated by dividing discounted benefits by discounted costs.

Value per cubic foot = Total NPV divided by total yield of all harvests in cunits (100 cubic feet).

Table N-3. Comparison of Yield Changes & Economic Returns for a 100 Year Rotation

Silvicultural System	% Change in Cubic Volume	Net Present Value (NPV)	% Change	Benefit/Cost Ratio	Value per CUnit
BASE	*	\$470	*	3.04	\$3.47
PCT	+2%	\$526	+11%	2.74	\$3.80
PCT/FERT	+5%	\$532	+13%	2.57	\$3.75
PCT/CT	+17%	\$625	+32%	1.86	\$3.84
PCT/FERT/CT	+20%	\$716	+52%	1.88	\$4.39
PCT/PRUNE	+2%	\$539	+15%	2.37	\$3.90

Notes:

% change in cubic volume is the increase in volume above that produced by base prescription (overstocked stand condition).

Net present value (NPV) is calculated by subtracting discounted costs from discounted benefits.

% change NPV is the percentage of NPV increase or decrease compared to the NPV of the base prescription.

Benefit cost ratio is calculated by dividing discounted benefits by discounted costs.

Value per cubic foot = Total NPV divided by total yield of all harvests in cunits (100 cubic feet)

Appendix N

Percent change in cubic volume is the net timber yield increase above that of the base silvicultural system expressed as percent of net conifer cubic volume. Net present value (NPV) is calculated by subtracting discounted costs of producing timber from the discounted revenues from harvest. Percent change in NPV is the change in NPV relative to the NPV of the base silvicultural system. The benefit cost ratio depicts total discounted revenues divided by total discounted costs.

Value per cunit (100 cubic feet) is a simple relationship between total net revenues gained from a set of practices and the total net timber yield. The ratio allows interpretation of how each silvicultural practice functions to positively or negatively affect quantity (volume production) and/or quality (additions to value) of products produced.

Table N-4 shows a comparison of two qualities influencing wood quality; average diameter at final harvest and average rings per inch.

All silvicultural systems showed an increase in timber yield above the base at both rotation ages analyzed. Gains were similar at both ages for silvicultural systems which included commercial thinning. The commercial thinnings harvest trees which would otherwise die before final harvest and would not be recoverable as a usable product (Smith 1962, Reukema and Bruce 1977). Those silvicultural systems that did not include commercial thinning did not recover this mortality and therefore showed a decline in percent yield increase at 100 years.

All silvicultural systems showed a positive economic return at both rotation ages simulated. All tested combinations of practices produced higher levels of economic return than the base level alone. Economic returns are greater for all systems for the 60 year rotations.

¹“Economic Efficiency of Intensive Management Practices for the Douglas SYU”, 1991; unpublished report on file at Roseburg BLM.

Table N-4. Selected Tree Characteristics Which Affect Wood Quality

Silvicultural System	60 YEARS		100 YEARS	
	Average DBH	Rings per Inch	Average DBH	Rings per Inch
BASE	11"	11	16"	13
PCT	15"	8	20"	10
PCT/FERT	16"	8	21"	10
PCT/CT	17"	7	23"	9
PCT/FERT/CT	18"	7	24"	8
PCT/PRUNE	15"	8	20"	10

Appendix O

Restrictions on Mineral and Energy Exploration and Development Activity

Introduction

This appendix discusses the leasing stipulations as they will be applied to BLM managed lands in the planning area under each alternative. Operating standards pertinent to the locatable and salable minerals program are also described. Mineral exploration and development on Federal lands must also comply with laws and regulations administered by several agencies of the State of Oregon; however, these requirements are not discussed in this document.

Leasable Mineral Resources

Oil and Gas Leasing

The Mineral Leasing Act of 1920 (as amended) provides that all publicly owned oil and gas resources be open to leasing, unless a specific land order has been issued to close the area. Through the land use planning process, the availability of these resources for leasing is analyzed, taking into consideration development potential and surface resources. Constraints on oil and gas operations are identified and placed in the leases as notices and stipulations. Oil and gas leases are then issued from the BLM Oregon State Office in Portland. Specific proposed notices and stipulations are listed by alternative later in this appendix.

The issuance of a lease conveys to the lessee an authorization to actively explore and/or develop the lease, in accordance with the attached stipulations and the standard terms outlined in the Federal Onshore Oil and Gas Leasing Reform Act (FOOGLRA). Restrictions on oil and gas activities in the planning area will take the form of timing limitations, controlled surface use, or no surface occupancy stipulations used at the discretion of the Authorized Officer to protect identified surface resources of special concern.

The field office which reviews the lease tract will attach stipulations to each lease before it is offered for bid. The review will be conducted by consulting the direction given in this Resource Management Plan. In addition, all lands administered by BLM within the planning area will be subject to the lease notices as shown on the following pages. All Federal lessees or operators are required to follow procedures set forth by: Onshore Oil and Gas Orders, Notices to Lessee (NTL), The Federal Oil and Gas Royalty Management Act (as amended), The Federal Onshore Oil and Gas Leasing Reform Act, and Title 43 Code of Federal Regulations, Part 3100.

Oil and Gas Operations

Geophysical Exploration

Geophysical operations may be conducted regardless of whether the land is leased or not. Notices to conduct geophysical operations on BLM surface are received by the Resource Area. Administration and surface protection are accomplished through close cooperation of the operator and the BLM. Seasonal restrictions may be imposed to reduce fire hazards, conflicts with wildlife, watershed damage, etc. An operator is required to file a "Notice of Intent to Conduct Oil and Gas Exploration Operations" for all geophysical activities on public land administered by BLM. The notice should adequately show the location and access routes, anticipated surface damages, and time frame. The operator is required to comply with written instructions and orders given by the Authorized Officer, and must be bonded. Signing of the Notice of Intent by the operator signifies agreement to comply with the terms and conditions of the notice, regulations, and other requirements prescribed by the Authorized Officer. A pre-work conference and/or site inspection may be required. Periodic checks during and upon completion of the operations will be conducted to ensure compliance with the terms of Notice of Intent, including reclamation.

Drilling Permit Process

The federal lessee or operating company selects a drill site based on spacing requirements, subsurface and surface geology, geophysics, topography, and economic considerations. Well spacing is determined by the Authorized Officer after considering topography, reservoir characteristics, protection of correlative rights, potential for well interference, interference with multiple use of lands, and protection of the surface and subsurface environments. Close coordination with the State would take place. Written field spacing orders are issued for each field. Exceptions to spacing requirements involving Federal lands may be granted after joint State and BLM review.

Notice of Staking

Once the company makes the decision to drill, it must decide whether to submit a Notice of Staking (NOS) or apply directly for a permit to drill. The NOS is an outline of what the company intends to do, including a location map and sketched site plan. The NOS is used to review any conflicts with known critical resource values and to identify the need for associated rights-of-way and special use permits. The BLM utilizes information contained in the NOS and obtained from the on-site inspection to develop conditions of approval to be incorporated into the application for permit to drill. Upon receipt of the NOS, the BLM posts the document and pertinent information about the proposed well in the District Office for a minimum of 30 days prior to approval, for review and comment by the public.

Application for Permit to Drill (APD)

The operator may or may not choose to submit a NOS; in either case, an Application for Permit to Drill (APD) must be submitted prior to drilling. An APD consists of two main parts: a 12-point surface plan that describes any surface disturbances and is reviewed by resource specialists for adequacy with regard to lease stipulations designed to mitigate impacts to identified resource conflicts with the specific proposal, and an 8-point subsurface plan that details the drilling program and is reviewed by the staff petroleum engineer and geologist. This plan includes provisions for casing, cementing, well control, and other safety requirements. For the APD option, the on-site inspection is used to assess possible impacts and develop provisions to minimize

these impacts. If the NOS option is not utilized, the 30 day posting period begins with the filing of the APD. Private surface owner input is actively solicited during the APD stage.

Geothermal Leasing

The Geothermal Steam Act of 1970 (as amended) provides for the issuance of leases for the development and utilization of geothermal steam and associated geothermal resources. Geothermal leasing and operational regulations are contained in Title 43 Code of Federal Regulations, Part 3200. Through the land use planning process the availability of the geothermal resources for leasing is analyzed, taking into consideration development potential and surface and subsurface resources. Constraints on geothermal operations are identified and placed in the leases as stipulations. Geothermal leases are then issued by the BLM Oregon State Office in Portland.

Geothermal resources within a known geothermal resource area (KGRA) are offered by competitive sale. Outside of KGRAs, leases can be issued non-competitively (over-the-counter). Prior to a competitive lease sale, or the issuance of a noncompetitive lease, each tract will be reviewed, and appropriate lease stipulations will be included. The review will be conducted by consulting the direction given in this resource management plan. The issuance of a lease conveys to the lessee authorization to actively explore and/or develop the lease in accordance with regulations and lease terms and attached stipulations. Subsequent lease operations must be conducted in accordance with the regulations, Geothermal Resources Operational Orders, and any Conditions of Approval developed as a result of site-specific NEPA analysis. In the planning area, restrictions in some areas will include timing limitations, controlled surface use, or no surface occupancy stipulations used at the discretion of the Authorized Officer to protect identified surface resources of special concern.

In addition to restrictions related to the protection of surface resources, the various stipulations and conditions could contain requirements related to protection of subsurface resources. These may involve drainage protection of geothermal zones, protection of aquifers from contamination, or assumption of responsibility for any unplugged wells on the lease.

Development of geothermal resources can be done only on approved leases. Orderly development of a geothermal resource, from exploration to production, involves several major phases that must be approved separately. Each phase must undergo the appropriate level of NEPA compliance before it is approved and subsequent authorization(s) is (are) issued.

Leasing Notice and Stipulation Summary

On the following pages, the mineral leasing notices and stipulations are shown by planning alternative. The tracts of land to which these apply will, in many cases, differ by alternative. Those notices and stipulations shown as common for all alternatives are considered to be the minimum necessary in order to issue leases in the operating area. Under all alternatives, the standard and the special status species leasing stipulations will be utilized on most lands. The powersite stipulation (Form 3730-1) would be utilized on lands within powersite reservations.

Stipulations also include waiver, exception, and modification criteria defined below. If the Authorized Officer determines that a stipulation involves an issue of major concern, waivers, exceptions, or modifications of the stipulation will be subject to at least a 30-day advance public review (43 CFR 3101.1-4). Waiver, exception, and modification are defined as follows:

Waiver - The lifting of a stipulation from a lease that constitutes a permanent revocation of the stipulation from that time forward. The stipulation no longer applies anywhere within the leasehold.

Exception - This is a one time lifting of the stipulation to allow an activity for a specific proposal. This is a case-by-case exemption. The stipulation continues to apply to all other sites within the leasehold to which the restrictive criteria apply. It has no permanent effect on the lease stipulation.

Modification - This is a change to a stipulation that either temporarily suspends the stipulation requirement or permanently lifts the application of the stipulation on a given portion of the lease. Depending on the specific modification, the stipulation may or may not apply to all other sites within the leasehold to which the restrictive criteria apply.

Throughout the alternatives, the "no surface occupancy" stipulation is used rather than not

leasing, because leasable minerals, if present, can be produced from most, if not all, of each of the parcels that are subject to this stipulation without impacting the value(s) needing protection.

Whenever a special stipulation, such as No Surface Occupancy (NSO), Timing, or Controlled Surface Use (CSU) is used, the need for the special stipulation is described in the "Objective" that follows the stipulation. By imposing these special stipulations, it has been concluded that less restrictive stipulations would not be adequate to meet the stated objective.

Leasing Notices

The following Notices are to be included in each lease for all lands administered by BLM within the planning area where the pertinent resource potential exists. Lease notices are attached to leases in the same manner as stipulations; however, there is an important distinction between lease notices and stipulations. Lease notices do not involve new restrictions or requirements. Any requirements contained in a lease notice must be fully supported in either laws, regulations, policy, onshore oil and gas orders, or geothermal resources operational orders.

Leasing Notices Common To All Alternatives

Notice

Special Status Species Stipulation

Resources: Botany and Wildlife

Stipulation: (All the)/(Certain) lands within this lease are within the suitable habitat of the (identify all Federal Threatened (FT), Endangered (FE) or Proposed Threatened (PT) & Proposed Endangered (PE) species, including scientific names), (an officially listed)/(a proposed for listing) Threatened or Endangered species. The Authorized Officer, through an environmental review process, has determined that because of the habitat characteristics of this species, all future post-lease operations must be analyzed and subjected to a U.S. Fish and Wildlife Service (FWS) Section 7 consultation or conference to ensure the action is not likely to jeopardize the continued existence of the species or result in the destruction or adverse modification of critical habitat.

(All the)/(Certain) lands within this lease are known to bear the species listed below which has (have) protected status as (State Threatened (ST); State Endangered (SE); Federal Candidate (FC); Bureau Sensitive (BS)); or are within the suitable habitat of (identify all State Threatened, State Endangered, Federal Candidate, or Bureau Sensitive species, including scientific names). These species are protected by BLM policy as described in Manual 6840. All future post-lease operations must be analyzed, utilizing recent field data collected at the proper time of year, to identify the presence of such species. If the field examination indicates that the proposed activity may adversely impact FC species, technical assistance will be obtained from FWS to insure that actions will not contribute to the need to list a federal candidate as a federal threatened or endangered species. Technical assistance may be obtained from FWS to insure that actions will not contribute to the need to list a ST, SE, or BS species as a federal threatened or endangered species.

Therefore, prior to any surface disturbing activities or even the use of vehicles off existing roads on (this lease)/(the lands legally described as: _____), BLM approval is required. This restriction also applies to geophysical activities for which a permit is required. The approval is contingent upon the results of site-specific inventories for any of the above mentioned species. The timing of these inventories is critical. They must be conducted at a time of year appropriate to determine the presence of the species or its habitat. The lessee is hereby notified that the process will take longer than the normal 30 days and that surface activity approvals will be delayed.

If no FT, FE, PT, or PE species, or suitable habitat, are found during the inventories, then no formal Section 7 consultation with the FWS will be necessary and the action will be processed using the procedures found in the applicable oil and gas Onshore Orders or geothermal resources operational orders. However, the lessee is hereby notified that, if any FT, FE, PT, PE, ST, SE, FC, or BS species are found during the inventories, or if the actions are proposed in designated or proposed critical habitat, then surface disturbing activities may be prohibited on portions of, or even all of the lease, unless an alternative is available that meets all of the following criteria: (a) The proposed action is not likely to jeopardize the continued existence of a threatened or endangered species; (b) the proposed action is not likely to destroy or adversely modify critical habitat for a threatened or endangered species; (c) the proposed action is consistent with the recovery needs

in approved Fish and Wildlife Service recovery plans or BLM Habitat Management Plans for the threatened or endangered species; and (d) the proposed action will not contribute to the need to list species as federal threatened or endangered.

Objective: To protect officially listed or proposed threatened or endangered plant or wildlife species; and to insure that post leasing oil and gas or geothermal operations will not likely contribute to the need to list other special status species as threatened or endangered.

Exception: An exception may be granted by the Authorized Officer, if review of the proposed plan submitted by the operator indicates that the proposed action will have no effect on the (common name of species).

Modification: The boundaries of the stipulated area may be modified, by the Authorized Officer, if it is determined that portions of the area do not have any officially listed or proposed threatened or endangered species, federal candidate, state threatened or endangered species, or Bureau sensitive species, or their habitat.

Waiver: This stipulation may be waived if the (common name) is declared recovered and is no longer protected under the Endangered Species Act, or if other species found within the lease are no longer considered to be in the federal candidate, state threatened or endangered, or Bureau sensitive categories.

Federal Threatened Species

Bald Eagle (*Haliaeetus leucocephalus*)
Marbled Murrelet (*Brachyramphus marmoratus*)
Northern Spotted Owl (*Strix occidentalis caurina*)

Federal Endangered Species

Bradshaw's Lomatium (*Lomatium bradshawii*)
American Peregrine Falcon (*Falco peregrinus anatum*)
Columbian white-tailed deer (*Odocoileus virginianus leucurus*)

Proposed Federal Threatened Species

Nelson's checkermallow (*Sidalcea nelsoniana*)

Proposed Federal Endangered Species

Umpqua chub (*Oregonichthys Kalawatseti*)

Federal Candidate Species

Howell's montia (*Montia howellii*)
Umpqua swertia (*Frasera umpquaensis*)

pink sandverbena (*Abronia umbellata*)
Gorman's aster (*Aster gormanii*)
wayside aster (*Aster vialis*)
golden paintbrush (*Castilleja levisecta*)
peacock larkspur (*Delphinium pavonaceum*)
Willamette daisy (*Erigeron decumbens*)
howellia (*Howellia aquatilis*)
Kincaid's lupine (*Lupinus sulphureus*)
white-topped aster (*Aster curtus*)

northern re-legged frog (*Rana aurora aurora*)
foothill yellow-legged frog (*Rana boylei*)
spotted frog (*Rana pretiosa*)
northwestern pond turtle (*Clemmys marmorata marmorata*)
northern goshawk (*Accipiter gentilis*)
harlequin duck (*Histrionicus histrionicus*)
mountain quail (*Oreortyx pictus*)
Pacific fisher (*Martes pennanti pacifica*)
white-footed vole (*Phenacomys albipes*)
Pacific western big-eared bat (*Plecotus townsendii townsendii*)

Bureau Sensitive Species

tall bugbane (*Cimicifuga elata*)
Willamette Valley larkspur (*Delphinium oregonum*)
shaggy horkelia (*Horkelia congesta*)
moss (*Limbella fryii*)
lichen (*Nephroma occultum*)
Thompson's mistmaiden (*Romanzoffia "thompsonii"*)
Oregon slender salamander (*Batrachoseps wrighti*)
fringed myotis (*Myotis thysanoides*)

State Threatened

Nelson's checkermallow (*Sidalcea nelsoniana*)

State Endangered

Bradshaw's Lomatium (*Lomatium bradshawii*)
pink sandverbena (*Abronia umbellata*)
Willamette daisy (*Erigeron decumbens*)

Notice

Cultural Resources: An inventory of the leased lands may be required prior to surface disturbance to determine if cultural resources are present and to identify needed mitigation measures. Prior to undertaking any surface-disturbing activities on the lands covered by this lease, the lessee or operator shall:

1. Contact the Bureau of Land Management (BLM) to determine if a cultural resource inventory is required. If an inventory is required, then;
2. The BLM will complete the required inventory; or the lessee or operator, at their option, may engage the services of a cultural resource consultant acceptable to the BLM to conduct a cultural resource inventory of the area of proposed surface disturbance. The operator may elect to inventory an area larger than the standard ten-acre minimum to cover possible site relocation, which may result from environmental or other considerations. An acceptable inventory report is to be submitted to the BLM for review and approval no later than that time when an otherwise complete application for approval of drilling or subsequent surface-disturbing operation is submitted.
3. Implement mitigation measures required by the BLM. Mitigation may include the relocation of proposed lease-related activities or other protective measures such as data recovery and extensive recordation. Where impacts to cultural resources cannot be mitigated to the satisfaction of the BLM, surface occupancy on that area must be prohibited. The lessee or operator shall immediately bring to the attention of the BLM any cultural resources discovered as a result of approved operations under this lease, and shall not disturb such discoveries until directed to proceed by the BLM.

Authorities: Compliance with Section 106 of the National Historic Preservation Act is required for all actions which may affect cultural properties eligible to the National Register of Historic Places. Section 6 of the Oil and Gas Lease Terms (Form 3100-11) requires that operations be conducted in a manner that minimizes adverse impacts to cultural and other resources.

Special Leasing Stipulations

The following special stipulations are to be utilized on specifically designated tracts of land as described under the various alternatives.

Leasing Stipulations Common To All Alternatives

No Surface Occupancy

Resource: Land Use Authorizations

Stipulation: Surface occupancy and use is prohibited on Recreation and Public Purposes (R&PP) and FLPMA leases.

Objective: To protect uses on existing R&PP and FLPMA leases.

Exception: An exception to this stipulation may be granted by the Authorized Officer, if the operator submits a plan demonstrating that impacts from the proposed action are acceptable or can be adequately mitigated.

Modification: The area affected by this stipulation may be modified by the Authorized Officer, if the land use authorization boundaries are modified.

Waiver: This stipulation may be waived by the Authorized Officer, if all land use authorizations within the leasehold have been terminated, canceled, or relinquished.

No Surface Occupancy

Resource: Recreation Sites

Stipulation: Surface occupancy and use are prohibited within developed recreation areas.

Objective: To protect developed recreation areas.

Exception: An exception to this stipulation may be granted by the Authorized Officer, if the operator submits a plan demonstrating that impacts from the proposed action are acceptable or can be adequately mitigated.

Modification: The boundaries of the stipulated area may be modified by the Authorized Officer, if the recreation area boundaries are changed.

Waiver: This stipulation may be waived, if the Authorized Officer determines that the entire leasehold no longer contains developed recreation areas.

No Surface Occupancy

A 30-day public notice period will be required prior to modification or waiver of this stipulation.

Resource: Special Areas

Stipulation: Surface occupancy and use are prohibited within Areas of Critical Environmental Concern (ACEC).

Objective: To protect important historic, cultural, scenic values, natural resources, natural systems or processes, threatened and endangered plant species, and/or natural hazard areas of the ACEC.

Exception: An exception to this stipulation may be granted by the Authorized Officer, if the operator submits a plan demonstrating that impacts from the proposed action are acceptable or can be adequately mitigated.

Modification: The boundaries of the stipulated area may be modified by the Authorized Officer, if the ACEC or EEA boundaries are changed.

Waiver: This stipulation may be waived, if the Authorized Officer determines that the entire leasehold no longer contains designated ACECs or EEAs.

No Surface Occupancy

Resource: Progeny test sites.

Stipulation: Surface occupancy and use are prohibited within progeny test sites.

Objective: To protect progeny test sites.

Exception: None.

Modification: The boundaries of the stipulated area may be modified by the Authorized Officer, if the progeny test site boundaries are changed.

Waiver: This stipulation may be waived, if the Authorized Officer determines that the entire leasehold no longer contains progeny test sites.

No Surface Occupancy

A 30-day public notice period will be required prior to modification or waiver of this stipulation.

Resource: Visual Resource Management (VRM)
Class I

Stipulation: Surface occupancy and use are prohibited in VRM Class I areas.

Objective: To preserve the existing character of the landscape.

Exception: An exception to this stipulation may be granted by the Authorized Officer, if the operator submits a plan demonstrating that impacts from the proposed action are acceptable or can be adequately mitigated.

Modification: The boundaries of the stipulated area may be modified by the Authorized Officer, if the boundaries of the VRM Class I area are changed.

Waiver: This stipulation may be waived by the Authorized Officer, if all VRM Class I areas within the leasehold are reduced to a lower VRM class. Areas reduced to VRM Class II will be subject to the Controlled Surface Use stipulation for visual resources, and areas reduced to VRM Class III will be subject to standard lease stipulations.

Controlled Surface Use

Resource: Soils

Stipulation: Prior to disturbance of any suspected unstable slopes or slopes over 60 percent, an engineering/reclamation plan must be approved by the Authorized Officer. Such plan must demonstrate how the following will be accomplished:

Site productivity will be restored.

Surface runoff will be adequately controlled.

Off-site areas will be protected from accelerated erosion, such as rilling, gullying, piping, and mass wasting.

Water quality and quantity will be in conformance with state and federal water quality laws.

Surface-disturbing activities will not be conducted during extended wet periods.

Construction will not be allowed when soils are frozen.

Objective: To maintain soil productivity, provide necessary protection to prevent excessive soil erosion on steep slopes, and to avoid areas subject to slope failure, mass wasting, piping, or having excessive reclamation problems.

Exception: An exception to this stipulation may be granted by the Authorized Officer if the operator submits a plan, which demonstrates that the impacts from the proposed action are acceptable or can be adequately mitigated.

Modification: The area affected by this stipulation may be modified by the Authorized Officer, if it is determined that portions of the area do not include suspected unstable slopes or slopes over 60 percent.

Waiver: This stipulation may be waived by the Authorized Officer if it is determined that the entire leasehold does not include any suspected unstable slopes or slopes over 60 percent.

Controlled Surface Use

A 30-day public notice period will be required prior to modification or waiver of this stipulation.

Resource: Visual Resource Management (VRM)
Class II.

Stipulation: All surface-disturbing activities, semipermanent and permanent facilities in VRM Class II areas may require special design including location, painting and camouflage to blend with the natural surroundings and meet the visual quality objectives for the area.

Objective: To control the visual impacts of activities and facilities within acceptable levels.

Exception: None.

Modification: None.

Waiver: This stipulation may be waived, if the Authorized Officer determines that there are no longer any VRM Class II areas in the leasehold.

No Additional Leasing Stipulations for the No Action Alternative

No Additional Leasing Stipulations for Alternative A

Additional Leasing Stipulations for Alternative B

Controlled Surface Use

Resource: Designated Mature and Old-Growth Forest Seral Stage Blocks

Stipulation: Unless otherwise authorized, drill site construction and access through designated mature and old-growth forest blocks within this leasehold will be limited to established roadways.

Objective: To protect vegetation to retain and/or restore older forests for seral stage diversity.

Exception: An exception to this stipulation may be granted by the Authorized Officer, if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be adequately mitigated.

Modification: The area affected by this stipulation may be modified by the Authorized Officer, if it is determined that portions of the area do not include designated mature and old-growth forest blocks.

Waiver: This stipulation may be waived by the Authorized Officer, if it is determined that the entire leasehold no longer includes designated mature and old-growth forest blocks.

Controlled Surface Use

Resource: Riparian Management Areas.

Stipulation: Unless otherwise authorized, drill site construction and access through riparian management areas within this leasehold will be limited to established roadways.

Objective: To protect riparian vegetation and reduce sedimentation.

Exception: An exception to this stipulation may be granted by the Authorized Officer, if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be adequately mitigated.

Modification: The area affected by this stipulation may be modified by the Authorized Officer, if it is determined that portions of the area do not include riparian areas, flood plains, or water bodies.

Waiver: This stipulation may be waived by the Authorized Officer, if it is determined that the entire leasehold no longer includes riparian management areas.

Additional Leasing Stipulations for Alternative C

Controlled Surface Use

Resource: Old-Growth Restoration and Retention Blocks

Stipulation: Unless otherwise authorized, drill site construction and access through old-growth restoration and retention blocks within this leasehold will be limited to established roadways.

Objective: To protect vegetation, to retain and/or restore old-growth forest.

Exception: An exception to this stipulation may be granted by the Authorized Officer, if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be adequately mitigated.

Modification: The area affected by this stipulation may be modified by the Authorized Officer, if it is determined that portions of the area do not include old-growth restoration and retention blocks.

Waiver: This stipulation may be waived by the Authorized Officer, if it is determined that the entire leasehold no longer includes old-growth restoration and retention blocks.

Additional Leasing Stipulations for Alternative D

Controlled Surface Use

Resource: Habitat Conservation Areas for the Northern Spotted Owl.

Stipulation: Unless otherwise authorized, drill site construction and access through habitat conservation areas within this leasehold will be limited to established roadways.

Objective: To protect habitat of the Northern Spotted Owl.

Exception: An exception to this stipulation may be granted by the Authorized Officer, if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be adequately mitigated.

Modification: The area affected by this stipulation may be modified by the Authorized Officer, if it is determined that portions of the area do not include habitat conservation areas.

Waiver: This stipulation may be waived by the Authorized Officer, if it is determined that the entire leasehold no longer includes habitat conservation areas, after consultation with the U.S. Fish and Wildlife Service.

Additional Leasing Stipulations for Alternative E

Controlled Surface Use

Resource: Forest stands older than 150 years.

Stipulation: Unless otherwise authorized, drill site construction and access through forest stands older than 150 years within this leasehold will be limited to established roadways.

Objective: To protect older forest stands.

Exception: An exception to this stipulation may be granted by the Authorized Officer, if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be adequately mitigated.

Modification: The area affected by this stipulation may be modified by the Authorized Officer, if it is determined that portions of the area do not include old forest stands.

Waiver: This stipulation may be waived by the Authorized Officer, if it is determined that the entire leasehold no longer includes old forest stands.

Additional Leasing Stipulations for the Preferred Alternative

No Surface Occupancy

Resource: Wildlife - Osprey Nest Sites

Stipulation: Surface occupancy and use is prohibited within one-quarter mile of known osprey nest sites, which have been active within the past 7 years.

Objective: To protect osprey nest sites.

Exception: An exception may be granted by the Authorized Officer, if the operator submits a plan which demonstrates that the proposed action will not affect the osprey or its nest site. If the Authorized Officer determines that the action may or will have an adverse effect on the species, the operator may submit a plan demonstrating that the impacts can be adequately mitigated. This plan must be approved by BLM.

Modification: The boundaries of the stipulated area may be modified, if the Authorized Officer determines that portion of the area can be occupied without adversely affecting the osprey or its nest site.

Waiver: This stipulation may be waived, if the Authorized Officer determines that the entire leasehold can be occupied without adversely affecting osprey or osprey nest sites.

Controlled Surface Use

Resource: Riparian Management Areas.

Stipulation: Unless otherwise authorized, drill site construction and access through riparian management areas within this leasehold will be limited to established roadways.

Objective: To protect riparian vegetation and reduce sedimentation.

Exception: An exception to this stipulation may be granted by the Authorized Officer, if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be adequately mitigated.

Modification: The area affected by this stipulation may be modified by the Authorized Officer, if it is determined that portions of the area do not include riparian areas, flood plains, or water bodies.

Waiver: This stipulation may be waived by the Authorized Officer, if it is determined that the entire leasehold no longer includes riparian management areas.

Authority: 43 CFR 3101.1-2

Controlled Surface Use

Resource: Old-Growth Emphasis Area and Connectivity Areas

Stipulation: Unless otherwise authorized, drill site construction and access through old-growth emphasis area and connectivity areas within this leasehold will be limited to established roadways.

Objective: To protect vegetation, to retain and/or restore old-growth forest.

Exception: An exception to this stipulation may be granted by the Authorized Officer, if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be adequately mitigated.

Modification: The area affected by this stipulation may be modified by the Authorized Officer, if it is determined that portions of the area do not include old-growth emphasis area and connectivity areas.

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Waiver: This stipulation may be waived by the Authorized Officer, if it is determined that the entire leasehold no longer includes old-growth emphasis area and connectivity areas.

Locatable Minerals Surface Management Standards for Exploration, Mining, and Reclamation on the Roseburg District

The following operational standards for mining activities have been compiled to assist the miner in complying with the 43 CFR 3809 regulations, which apply to all mining operations on BLM administered lands in the Roseburg District. The manner in which the necessary work is to be done will be site specific and all of the following standards may not apply to every mining operation. It is the mining claimant's and operator's responsibility to avoid "unnecessary or undue degradation," and to perform all the necessary reclamation work. Refer to the 43 CFR 3809 regulations for general requirements. BLM's Solid Mineral Reclamation Handbook (H-3042-1) provides the basic standards for the reclamation of mining and exploration sites that are within the Roseburg District.

There is an intergovernmental agreement between the BLM and the Oregon Department of Geology and Mineral Industries that is designed to avoid duplication of regulations, inspections, and approval of reclamation plans as well as to minimize repetitive costs to mining operators. The following guidelines include some, but not all, of the requirements of the various State agencies overseeing mining operations.

Prospecting, Exploration, and Mining

Surface Disturbance

BLM Requirements

Operations ordinarily resulting in only negligible disturbance as defined in 43 CFR 3809.0-5(b) are considered to be casual use and no notification to or

approval by the BLM is required. All operators proposing occupancy, timber removal, use of mechanized earth moving equipment, or suction dredges having hoses with an inside diameter greater than 4 inches which would cause a surface disturbance of 5 acres or less during any calendar year must provide written notice to the District Office at least 15 days prior to the commencement of any surface mining disturbance. For operations in sensitive areas or which will cause greater than 5 acres of surface disturbance, the operator is required to submit a plan of operations pursuant to the regulations in 43 CFR 3809.1-4.

State of Oregon Requirements

Out of stream mining which disposes of all waste water by evaporation and/or seepage, with no readily-traceable discharge to groundwater or surface water and involves processing of up to 10,000 cubic yards of material per year, must be authorized under General Permit #0600 issued by the Department of Environmental Quality (D.E.Q.). In-stream use of suction dredges must be authorized by Permit #0700-J issued by the D.E.Q.

Fill, removal or alteration of over 50 cubic yards of material in any waters of the state requires a Removal-Fill permit from the Division of State Lands. This permit is required for any relocation of flowing streams in conjunction with mining.

Any person engaging in mineral exploration that disturbs more than one surface acre or involves drilling to greater than 50 feet must obtain an exploration permit from the Oregon Department of Geology and Mineral Industries (DOGAMI). Mining operations involving 5,000 or more cubic yards of material per year or disturbing one or more acres of land will require an operating permit from DOGAMI.

Vegetation/Timber Removal

Remove only that vegetation which is in the way of mining activities. An application must be submitted to the Authorized Officer pursuant to 43 CFR 3821.4 describing the proposed use of merchantable timber from O & C lands for mining purposes. No merchantable trees may be cut until the application is approved and the trees are marked. The Roseburg BLM office recommends that small trees (less than 7 inches dbh) and shrubs be lopped and scattered, or shredded for use as mulch. Trees greater than or equal to 7 inches diameter breast height (dbh) are to

be bucked and stacked in an accessible location unless they are needed for the mining operation.

Firewood

Merchantable timber may not be used for firewood. Firewood permits may be issued to the operator for use in conjunction with the mining operation but no wood may be used until a permit is obtained from the BLM. Permits will be limited to hardwoods or salvage timber which is not considered to be merchantable. Firewood authorized for use in conjunction with a mining operation is not to be removed from the mining claim.

Topsoil

All excavations should have all the productive topsoil (usually the top 12 to 18 inches) first stripped, stockpiled, and protected from erosion for use in future reclamation. This also includes removal of topsoil before the establishment of mining waste dumps and tailings ponds, if the waste material will be left in place during reclamation.

Roads

Existing roads and trails should be used as much as possible. Temporary roads are to be constructed to a minimum width and with minimum cuts and fills. All roads shall be constructed so as to minimize negative impacts to slope stability.

Wetlands

When proposed mining activities will fill or alter wetland areas, the operator must contact the Department of the Army, Corps of Engineers for the appropriate permit. A copy of the permit must be submitted to the Authorized Officer in conjunction with a Notice or Plan of Operations.

Water Quality

When mining will be in or near bodies of water, or sediment (or other pollutants) will be discharged, contact the Department of Environmental Quality. A settling pond is required when mining operations discharge turbid water. It is the operator's responsibility to obtain any needed suction dredging, stream bed alteration, or water discharge permits

required by the DEQ or other State agencies. Copies of such permits shall be provided to the Authorized Officer when a Notice or Plan of Operations is filed. All operations including casual use, shall be conducted in a manner so as to prevent unnecessary or undue degradation of surface and subsurface water resources and shall comply with all pertinent Federal and State water quality laws.

Claim Monuments

State law prohibits the use of plastic pipe for claim staking in Oregon. BLM policy requires all existing plastic pipe monuments to have all openings permanently closed. Upon loss or abandonment of the claim, all plastic pipe must be removed from the public lands. When old markers are replaced during normal claim maintenance, they shall be either wood posts or stone or earth mounds, constructed in accordance with the requirements of State law.

Drill Sites

Exploratory drill sites should be located next to or on existing roads when possible without blocking public access. When drill sites must be constructed, the size of the disturbance shall be as small as possible. operations. Any operator engaging in mineral exploration that involves drilling to greater than 50 feet must obtain an exploration permit from the Oregon Department of Geology and Mineral Industries (ORS 517.962).

Dust and Erosion Control

While in operation, and during periods of shut-down, exposed ground surfaces susceptible to erosion will need to be protected. This can be accomplished with seeding, mulching, installation of water diversions, and routine watering of dust producing surfaces.

Fire Safety

All State fire regulations must be followed, including obtaining a campfire permit or blasting permit, if needed. All internal gas combustion engines must be equipped with approved spark arresters.

Safety and Public Access

Under Public Law 167, the Government has the right to dispose and manage surface resources (including

timber) on mining claims located after July 23, 1955. These rights are limited to the extent that they do not endanger or materially interfere with any phase of an ongoing mining operation or uses reasonably incident thereto. Claims located prior to July 23, 1955 may have surface rights, if such claims were verified as being valid under Sections 5 and 6 of the Act. Most do not.

Mining claimants shall not exclude the public from mining claims with force, intimidation, or no trespassing signs. In the interest of safety, the general public can be restricted only from specific dangerous areas (underground mines, open pits or heavy equipment storage areas) by erecting fences, gates and warning signs. It is the operator's responsibility to protect the public from mining hazards. Gates or road blocks may be installed on existing or proposed roads only with BLM approval. Gates restricting public access onto a mine site will only be considered in such cases where there is a large area safety hazard created by the mining activity. The determination as to whether a safety hazard is large enough to warrant a gate will be determined on a case-by-case basis. Fences (rather than gates) or other approved barriers shall be utilized to protect the public from hazards related to small excavations, tunnels, and shafts.

Roads which cross private land to reach BLM administered lands are controlled by the private parties. While some of these roads have been assigned BLM road numbers access may only be granted for administrative use to the BLM, and its licensees and permittees under a nonexclusive easement. Mining claimants are not considered licensees or permittees and so must make their own arrangements with the private party in order to use such roads. No right is granted under any of the mining laws to use a road involved in a nonexclusive easement.

Sewage

Self-contained or chemical toilets are generally to be used at exploration or mining operations and their contents shall be disposed of at approved dump stations. Outhouses and uncontained pit toilets are considered unnecessary and undue degradation and are not allowed. Uncontained pit toilets are not allowed for other users of the public land in this district, and we believe no special rights regarding this issue are granted under the mining laws. County sanitation permits are required for all other types of sanitation facilities.

Structures

It is District policy that permanent structures will not be allowed for exploration or prospecting operations. Permanent structures are fixed to the ground by any of the various types of foundations, slabs, piers, poles, or other means allowed by State or County building codes. The term shall also include a structure placed on the ground that lacks foundations, slabs, piers or poles, and that can only be moved through disassembly into its component parts or by techniques commonly used in house moving. Any temporary structures placed on public lands in conjunction with prospecting or exploration are allowed only for the duration of such activities, unless expressly allowed in writing by the Authorized Officer to remain on the public lands. Temporary structures are defined as structures not fixed to the ground by a foundation and that can be moved without disassembly into their component parts.

Permanent structures (as described above) may be allowed for mining operations if they are deemed reasonably incident to conducting the operations. Mining operations are defined as all functions, work, facilities, and activities in connection with development, mining, or processing mineral deposits.

All permanent or temporary structures placed on public lands shall conform with the appropriate State or local building, fire, and electrical codes, and occupational safety and health and mine safety standards.

Equipment

The claimant must maintain the claim site, including structures and equipment, in a safe and orderly condition. Only equipment and supplies that are appropriate, reasonable, and in regular use for exploration or mining will be allowed on the claim. Equipment transportable by a pickup or small trailer or used only infrequently should not be stored on the claim and will not be considered as a justification for site occupancy. Accumulation of unused and/or inoperable equipment, materials not related to actual operations, and trash, garbage, or junk is not allowed on the public lands. The storage of such on the public land is unnecessary and undue degradation and will be treated accordingly.

Animals

If dogs or cats are to be present at the work site, the operator is required to keep them under control at all times so that they do not chase wildlife, or threaten other people, including government employees conducting site inspections on the public lands. Unless otherwise permitted, animals such as cows, chickens, goats, pigs or horses are not considered necessary to conduct mining operations and are not allowed on mining claims.

Suction Dredging

BLM Requirements

Cases Where a Notice or Plan of Operations is Required:

Filing either a Notice or Plan of Operations may be required for all suction dredge operations where the dredge has an intake nozzle equal to or less than 4 inches in diameter, or where any suction dredge operator proposes occupancy on BLM land (in excess of 14 calendar days per year) or the installation of structures of any kind. The determination of the need for a notice on smaller dredges will be made on a case by case basis.

No Notice or Plan of Operations Required:

The use of a suction dredge in a stream and having an intake nozzle of less than 4 inches in diameter, where no structures or occupancy beyond the 14 calendar day per year camping limit is proposed, will not generally require the filing of a Notice or Plan of Operations. Such activity is generally considered casual use.

At the existing Cow Creek Recreation Site, which is withdrawn from mining claim location, the use of hand tools (including shovels, gold pans, and sluice boxes), and suction dredges with a suction hose of four inches or less, is allowed with no permits required by the BLM district office. Recreational miners are required to comply with the D.E.Q. requirements as described below. Larger suction dredges with suction hoses having a diameter greater than 4 inches are not allowed at this recreation site. Additional information on recreational mining at this

site is available from the reception desk at the BLM District Office.

State of Oregon Requirements

All suction dredge operations must be authorized by Permit #0700-J issued by the Department of Environmental Quality. This permit is issued free of charge for dredges having hoses with an inside diameter of 4 inches or less. Registration and a filing fee of \$50.00 is required for suction dredges having hoses with an inside diameter greater than 4 inches. Mining operators should contact the Department of Environmental Quality, Water Quality Division, 811 S.W. Sixth Avenue, Portland, Oregon 97204, or the Roseburg DEQ office.

Suction dredging outside the "permitted work period" established for certain waterways by the Oregon Department of Fish and Wildlife (ODFW) will require written permission by an appropriate ODFW District Biologist.

The river beds of navigable waterways are controlled by the Oregon Division of State Lands.

Tailings Ponds

Settling ponds must be used to contain sediment, and any discharge must meet the standards of the Oregon Department of Environmental Quality.

Solid and Hazardous Waste

Trash, garbage, used oil, etc. must be removed from public land and disposed of properly. Trash, garbage or hazardous wastes must not be buried on public lands. Accumulations of trash, debris, or inoperable equipment on public lands is viewed as unnecessary degradation and will not be tolerated. Operators conducting illegal disposals shall be held financially responsible for the clean-up of such disposals.

Cultural and Paleontological Resources

Operators shall not knowingly alter, injure, or destroy any scientifically important paleontological (fossil) remains or any historical or archaeological site, structure, or object on federal lands or any identified traditional use areas. The operator shall immediately bring to the attention of the Authorized Officer, any paleontological (fossil) remains or any historical or

archaeological site, identified traditional cultural properties, structure, or object that might be altered or destroyed by exploration or mining operations, and shall leave such discovery intact until told to proceed by the Authorized Officer. The Authorized Officer shall evaluate the discovery, take action to protect or remove the resource, and allow operations to proceed.

Threatened and Endangered Species of Plants and Animals

Operators shall take such action as may be needed to prevent adverse impacts to threatened or endangered species of plants and animals and their habitat that may be affected by operations, as stipulated in guidelines developed through consultation with the U.S. Fish and Wildlife Service. Under Notice-level operations, if the review of the notice by BLM reveals that a potential conflict with a threatened or endangered species exists, the operator will be advised not to proceed and informed that a knowing violation of the taking provision of the Endangered Species Act will result in a notice of noncompliance and may result in criminal penalties. If the operator wishes to develop measures that will eliminate the conflict, then the Authorized Officer will arrange for the participation of BLM resource specialists and the U.S. Fish and Wildlife Service in reviewing the proposed revision to the Notice. If processing a proposed Plan of Operations indicates that a potential conflict exists with a threatened or endangered species or its habitat, the Authorized Officer shall notify the operator that the plan cannot be approved until BLM has complied with Section 7 of the Endangered Species Act. Special status species (Federal Candidate/Bureau Sensitive) plants and animals, and their habitat will be identified by the Authorized Officer, and shall be avoided wherever possible.

Occupancy at Mining Sites

Living on public land, in excess of 14 days per calendar year, must be reasonably incident to and required for actual continuous mining or diligent exploration operations and will require either a Notice or Plan of Operations. In general, operations at the casual use level are not sufficient to warrant occupancy on a mining claim. The following discussion of occupancy only applies to those operators wishing to assert their right to live for an extended period or full-time on public lands pursuant to privileges granted under the mining laws. It does

not apply to operators proposing to camp at prospecting or mining sites on weekends or one to two days during the week.

Only those persons working on a continuous mining or exploration operation will be allowed to live on the claim beyond the 14-day per calendar year camping limit. A continuous mining or exploration operation is defined as an operation necessitating at least 40 hours of work per week at the operating site. The Oregon State Bureau of Labor and Industries generally considers that full-time work consists of a minimum of 40 hours worked per week. Each person proposing to live full-time at the site would be expected to conduct a minimum of 40 hours of work each week. Work hours are to be specified in the Notice or Plan of Operation at the time of submittal to the district BLM office. Should work hours be altered periodically or seasonally, it is the responsibility of the operator to notify the BLM (prior to the change) so that the Notice or Plan can be modified. Camping sites used in conjunction with mineral exploration or extraction operations are expected to be kept in a neat and orderly condition. If operations cannot be pursued due to high fire danger in forested areas, then living on the claim site will not be permitted. Any occupancy beyond 90 days must be in accordance with the requirements of the Douglas County Planning Department.

Security Guard

In some cases, it may be reasonably incident for a security guard to live on site in order to protect valuable property, equipment, or workings which are necessary for the mining operation, or to protect the public from site hazards. The need for a security guard shall be such that the person with those duties is required to be present at the site whenever the operation is shut down temporarily or at the end of the workday, or whenever the mining claimant, operator, or workers are not present on the site. The proposed occupancy by a security guard must be described in the Notice or Plan of Operations.

Reclamation

Reclamation of all disturbed areas must be performed concurrently or as soon as possible after exploration or mining ceases and shall conform to the guidelines described in BLM Handbook H-3042-1. Reclamation shall include, but shall not be limited to: 1) saving topsoil for final application after reshaping disturbed areas; 2) measures to control erosion, landslides, and water runoff; 3) measures to isolate,

remove or control toxic materials; 4) reshaping the area disturbed, applying topsoil, and revegetating disturbed areas where reasonably practicable; and 5) rehabilitation of fisheries and wildlife habitat. When reclamation of the disturbed area has been completed, except to the extent necessary to preserve evidence of mineralization, the BLM must be notified so that an inspection of the area can be made.

Equipment and Debris

All mining equipment, vehicles, and structures must be removed from the public lands during extended periods of nonoperation and/or at the conclusion of mining, unless authorization from BLM is given to the operator or claimant in writing. Accumulations of debris and trash on mining claims is considered unnecessary and undue degradation and must be removed immediately regardless of the status of the operation. Failure to do so will result in the issuance of a notice of noncompliance or a citation under State law.

Backfilling and Recontouring

The first steps in reclaiming a disturbed site are backfilling excavations and reducing high walls, if feasible. Coarse rock material should be replaced first, followed by medium sized material, with fine materials to be placed on top. Recontouring means shaping the disturbed area so that it will blend in with the surrounding lands, minimize the possibility of erosion, and facilitate revegetation.

Seedbed Preparation

Recontouring should include preparation of an adequate seedbed. This is accomplished by ripping or disking compacted soils to a depth of at least 6 inches in rocky areas and at least 18 inches in less rocky areas. This should be done following the contour of the land to limit erosion. All stockpiled settling pond fines, and then topsoil, shall be spread evenly over the disturbed areas.

Fertilizer

Due to the generally poor nutrient value of mined soils, it may be necessary to use fertilizer to ensure maximum yield from the seeding mixture. The fertilizer (16-16-16, or other approved mix) should be

spread at the rate of 200 lbs/acre, but not allowed to enter streams or bodies of water.

Seeding

BLM approved seeding prescription must be used to provide adequate revegetation for erosion control, wildlife habitat, and productive secondary uses of public lands. Seeding should be done in September or October in the Roseburg District to ensure that seed is in the ground prior to the first significant winter rains. If seeding fails, or is done at the wrong time, the operator may be asked to reseed the area at the appropriate time, as determined by the Authorized Officer.

Broadcast seeding is preferable on smaller sites. When using a whirlybird type seed spreader, it is important to keep the different seeds well mixed to achieve even seed distribution. For the best results, a drag harrow should be pulled over the seeded area to cover the seed before mulching. The Authorized Officer may recommend hydroseeding on critical sites for rapid coverage and erosion control on cut banks, fill slopes, and any other disturbed areas.

Tree Replacement

Replacement of destroyed trees may be necessary with the planting of seedlings or container stock.

Mulch

As directed by the BLM, during review of the Notice or Plan of Operations, the disturbed area may require mulching during interim or final reclamation procedures. Depending on site conditions, the mulch may need to be punched, netted, or blown on with a tackifier to hold it in place. In some cases, erosion control blankets may be cost effective for use.

Roads

After mining is completed, all new roads shall be reclaimed, unless otherwise specified by the BLM. High walls and cutbanks are to be knocked down or backfilled to blend with the surrounding landscape. All culverts shall be removed from drainage crossings and the fill shall be cut back to the original channel. The roadbed should be ripped to a minimum depth of 18 inches to reduce compaction and provide a good seedbed. The road must then be fertilized, seeded and mulched if necessary. When necessary, water

bars are to be used to block access and provide drainage.

Tailings Ponds

The ponds should be allowed to dry out and the sediments removed and spread with the topsoil, unless the sediments contain toxic materials. If the ponds contain toxic materials, a plan will be developed to identify, dispose, and mitigate effects of the toxic materials. If necessary, a monitoring plan will also be implemented. The ponds should then be backfilled and reclaimed.

Visual Resources

To the extent practicable, the reclaimed landscape should have characteristics that approximate or are compatible with the visual quality of the adjacent area.

Guidelines for Development of Salable Mineral Resources in the Roseburg District

Proposed Operations

All proposed salable mineral developments, and any exploration that involves surface disturbance, should have operation and reclamation plans approved by the Authorized Officer. All proposals will undergo the appropriate level of review and compliance with the National Environmental Policy Act.

Quarry Design

Due to steep terrain in the operating area, most quarry developments would require a series of benches to effectively maximize the amount of mineral materials to be removed in a safe manner. In all cases, bench height shall not exceed 40 feet. If the bench would be used by bulldozers to access other parts of the quarry, the width of the bench should be at least 25 feet. If the bench won't be used by equipment, then this width can be reduced to approximately 10 feet.

Clearing of timber and brush should be planned at least 10 feet beyond the edge of the excavation limit. Most often the brush would be piled and burned at the site, or scattered nearby.

If at all possible, all topsoil and overburden should be stockpiled and saved for eventual quarry site reclamation. These piles may need to be stabilized by mulching or seeding in order to minimize erosion during the winter months.

As a standard procedure, the excavation of the quarry floor should be designed with an outslope of approximately two percent in order to provide for adequate drainage of the floor. Compliance with this design should be made a requirement of all operators at the site.

Operating Procedures

Where practicable, the following requirements should be made a part of every contract or permit providing for the use of mineral material sites on the district:

Oversized boulders shall not be wasted, but shall be broken and utilized concurrently with the excavated material unless otherwise specified.

The operator shall comply with local and State safety codes covering quarry operations, warning signs and traffic control. All necessary permits must be obtained from State and County agencies.

Use of the site for equipment storage and stockpiling rock material is allowed for the duration of the contract or permit. Use of the site beyond that time would be authorized under a temporary use permit.

All topsoil shall be stockpiled or windrowed as appropriate, for use in reclamation.

Prior to abandonment, all material sites will be graded to conform with the surrounding topography. Topsoil will be utilized to create a medium for revegetation. Reseeding and tree planting, if necessary, will be done as prescribed by the Authorized Officer. Access roads no longer needed by the BLM will be abandoned and reclaimed as directed by the Authorized Officer.

Appendix P

Management Guidelines and Standards for National Wild and Scenic Rivers

The Wild and Scenic Rivers Act (Public Law 90-542 as amended) established a method for providing Federal protection for certain of our remaining free flowing rivers, and preserving them and their immediate environments for the use and enjoyment of present and future generations. Rivers are included in the system so that they may benefit from the protective management and control of development for which the Act provides. The following guidelines and standards are extracted in part from the February 3, 1970, and August 26, 1982, joint Department of the Interior and Department of Agriculture guidelines. They would apply to formally designated rivers through incorporation in formal management plans, which are normally developed within three years of designation. The guidelines also apply, on an interim basis, to BLM-administered lands along BLM study rivers, as well as other rivers or river segments that have been found by the Bureau to be eligible for consideration as components of the National Wild and Scenic River System. In the latter instance, interim application of the guidelines will continue until lifted by a determination of nonsuitability through BLM's planning (RMP) process or by Congressional action.

Section 10(a) of the Act states that:

“Each component of the National Wild and Scenic Rivers System (WSR) shall be administered in such a manner as to protect and enhance the values which caused it to be included in said system without, insofar as is consistent therewith, limiting other uses that do not substantially interfere with public use and enjoyment of these values. In such administration, primary emphasis shall be given to protecting its aesthetic, scenic, historic, and scientific features. Management plans for any such component may establish varying degrees of intensity for its protection and development, based on the special attributes of the area.”

This section is interpreted by the Secretaries of the Interior and Agriculture as stating a nondegradation and enhancement policy for all designated river areas, regardless of classification.

The Congress with Presidential approval may determine which river segments will be added to the Wild and Scenic River System. When a river is designated, and BLM is identified as the administering Federal agency, BLM will establish administrative boundaries to protect the identified Outstandingly Remarkable Values. By law, the land inside the boundaries normally may not exceed an average of 320 acres per river mile over the designated portion of the river. BLM would delineate boundaries based on natural or man-made features (canyon rims, roads and ridgetops, etc.) and with consideration of legally identifiable property lines.

A river management plan must be also completed by the administering Federal agency, within three years after designating legislation. Existing State, local and Federal laws continue in effect during the interim along with general Department of Interior guidelines. If Federal designation overlaps State Scenic Waterway designation, a joint Federal/State management plan would be developed. All management plans will address the roles of Federal, State, County, and relevant Indian tribal governments in management of the river.

Discussion of BLM's inventory to determine which river stretches are eligible for consideration as components of the system is presented in Chapter 3 and Appendix Q. Also included in that appendix are discussions of the criteria for eligibility for each classification (wild, scenic, recreational) for which any river reviewed has been found eligible and the results of BLM's eligibility studies.

The guidelines that follow are presented for each separate river classification (recreational, scenic, and wild).

Recreational River Areas

Recreational river areas are defined by the Act to be “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.”

Management Objective for Recreational River Areas

Management of recreational river areas should give primary emphasis to protecting the values which make it an Outstandingly Remarkable Value while providing river-related outdoor recreation opportunities in a recreational setting. Recreational classification is a determination of the level of development and does not prescribe or assume recreation development or enhancement.

Management of recreational river areas can and should maintain and provide outdoor recreation opportunities. The basic distinctions between a "scenic" and a "recreational" river area are the degree of access, extent of shoreline development, historical impoundment or diversion, and types of land use. In general, a variety of agricultural, water management, silvicultural, recreational, and other practices or structures are compatible with recreational river values, providing such practices or structures are carried on in such a way that there is no substantial adverse effect on the river and its immediate environment.

Management Standards for Recreational River Areas

Recreation facilities may be established in proximity to the river, although recreational river classification does not require extensive recreational developments. Recreational facilities may still be kept to a minimum, with visitor services provided outside the river area. Future construction of impoundments, diversions, straightening, riprapping, and other modification of the waterway or adjacent lands would not be permitted except in instances where such developments would not have a direct and adverse effect on the river and its immediate environment.

The following program management standards apply:

1. **Forestry Practices:** Forestry practices including timber harvesting would be allowed under standard restrictions to avoid adverse effects on the river environment and its associated values.
2. **Hydroelectric Power and Water Resource Development:** No development of hydroelectric power facilities would be permitted. Existing low dams, diversion works, riprap and other minor structures may be maintained provided the waterway remains generally natural in appearance. New structures may be allowed provided that the area remains generally natural

in appearance and the structures harmonize with the surrounding environment.

3. **Mining:** Subject to existing regulations (e.g., 43 CFR 3809) and any future regulations that the Secretary of the Interior may prescribe to protect values of rivers included in the Wild and Scenic Rivers System; new mining claims are allowed and existing operations are allowed to continue. All mineral activity on Federally administered land must be conducted in a manner that minimizes surface disturbance, water sedimentation and pollution, and visual impairment. Reasonable mining claim and mineral lease access will be permitted. Mining claims, subject to valid existing rights, within the recreational river area boundary can be patented only as to the mineral estate and not the surface estate (subject to proof of discovery prior to the effective date of designation).
4. **Road and Trail Construction:** Existing parallel roads can be maintained on one or both river banks. There can be several bridge crossings and numerous river access points. Roads, trails, and visitor areas must conform to construction and maintenance standards and be free of recognized hazards.
5. **Agricultural Practices and Livestock Grazing:** Lands may be managed for a full range of agriculture and livestock grazing uses, consistent with current practices.
6. **Recreation Facilities:** Interpretive centers, administrative headquarters, campgrounds, and picnic areas may be established in proximity to the river. However, recreational classification does not require extensive recreation development.
7. **Public Use and Access:** Recreation use including, but not limited to, hiking, fishing, hunting, and boating is encouraged in recreational river areas to the extent consistent with the protection of the river environment. Public use and access may be regulated and distributed where necessary to protect and enhance recreational river values. Any new structures must meet established safety and health standards or in their absence be free of any recognized hazard.
8. **Rights-of-Way:** New transmission lines, natural gas lines, water lines, etc., are discouraged unless specifically prohibited outright by other plans, orders and laws. Where no reasonable alternate location exists, additional or new

facilities should be restricted to existing rights-of-way. Where new rights-of-way are unavoidable, locations and construction techniques will be selected to minimize adverse effects on recreational river area related values and fully evaluated during the site selection process.

9. **Motorized Travel:** Motorized travel on land will generally be permitted, on existing roads. Controls will usually be similar to that of surrounding lands. Motorized travel on water will be in accordance with existing regulations or restrictions.
10. **Instream Flow Assessment:** To the extent practical, consistent with resource management objectives, quantify instream flow and protection requirements related to Outstandingly Remarkable and other resource values identified through the RMP process. Where possible, conduct a comprehensive, interdisciplinary, resource value-based assessment in order to delineate resource values, relate flows to resource conditions, and formulate flow protection strategies that incorporate legal, technical, and administrative aspects in order to secure instream flows which address values associated with the recreational river segment.

Scenic River Areas

Scenic river areas are defined by the Act to be "Those rivers or sections of rivers that are free of impoundments, with shorelines or watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads."

Management Objective for Scenic River Areas

Management of scenic river areas should maintain and provide outdoor recreation opportunities in a near natural setting. In general, a wide range of agricultural, water management, silvicultural and other practices or structures could be compatible with scenic river values, providing such practices or structures are carried on in such a way that there is no substantial adverse effect on the river and its immediate environment.

Management Standards for Scenic River Areas

The same limitations set forth for recreational river areas are applicable, except that developments should harmonize with the environment, and developments on shore lands should be screened from the river. The following program management standards apply:

1. **Forestry Practices:** Silvicultural practices including timber harvesting could be allowed provided that such practices are carried on in such a way that there is no substantial adverse effect on the river and its immediate environment. The river area should be maintained in its near natural condition. Timber outside the boundary, but within the visual seen area, should be managed and harvested in a manner which provides special emphasis on visual quality. Preferably, reestablishment of tree cover would be through natural revegetation. Cutting of dead and down materials for fuelwood should be limited. Where necessary, restrictions on use of wood for fuel may be prescribed.
2. **Hydroelectric Power and Water Resource Development:** No development of hydroelectric power facilities would be permitted. Flood control dams and levees would be prohibited. All water supply dams and major diversions are prohibited. Maintenance of existing facilities and construction of some new structures would be permitted provided that the area remains natural in appearance and the practices or structures harmonize with the surrounding environment.
3. **Mining:** Subject to existing regulations (e.g., 43 CFR 3809) and any future regulations that the Secretary of the Interior may prescribe to protect the values of rivers included in the WSR System; new mining claims are allowed and mineral leases can be allowed. All mineral activity on Federally administered land must be conducted in a manner that minimizes surface disturbance, water sedimentation and pollution, and visual impairment. Reasonable mining claim and mineral lease access will be permitted. Mining claims, subject to valid existing rights, within the scenic river area boundary can be patented only as to the mineral estate and not the surface estate (subject to proof of discovery prior to the effective date of designation).

4. **Road and Trail Construction:** Roads or trails may occasionally bridge the river area and short stretches of conspicuous roads or long stretches of inconspicuous and well-screened roads could be allowed. Maintenance of existing roads and trails, and any new roads or trails, will be based on the type of use for which the roads or trails are constructed and the type of use that will occur in the river area.
5. **Agricultural Practices and Livestock Grazing:** A wide range of agricultural and livestock grazing uses is permitted to the extent currently practiced. Row crops are not considered as an intrusion of the "largely primitive" nature of scenic corridors as long as there is not a substantial adverse effect on the natural-like appearance of the river area.
6. **Recreation Facilities:** Larger-scale public use facilities, such as moderate-sized campgrounds, interpretive centers, or administrative headquarters are allowed if such facilities are screened from the river.
7. **Public Use and Access:** Recreation use including, but not limited to, hiking, fishing, hunting, and boating is encouraged in scenic river areas to the extent consistent with the protection of the river environment. Public use and access may be regulated and distributed where necessary to protect and enhance scenic river values.
8. **Rights-of-Way:** New transmission lines, natural gas lines, etc., are discouraged unless specifically authorized by other plans, orders or laws. Where no reasonable alternative exists, additional or new facilities should be restricted to existing rights-of-way. Where new rights-of-way are unavoidable, locations and construction techniques will be selected to minimize adverse effects on scenic river area related values and fully evaluated during the site selection process.
9. **Motorized Travel:** Motorized travel on land or water may be permitted, prohibited or restricted to protect river values. Prescriptions for management of motorized use may allow for search and rescue and other emergency situations.
10. **Instream Flow Assessment:** To the extent practical, consistent with resource management objectives, quantify instream flow and protection requirements related to Outstandingly Remarkable and other resource values identified through the RMP process. Where possible,

conduct a comprehensive, interdisciplinary, resource value-based assessment in order to delineate resource values, relate flows to resource conditions, and formulate flow protection strategies which incorporate legal, technical, and administrative aspects in order to secure instream flows which address values associated with the scenic river segment.

Wild River Areas

Wild river areas are defined by the Act to include "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."

Management Objective for Wild River Areas

Management of wild river areas should give primary emphasis to protecting the values which make it Outstandingly Remarkable while providing river-related outdoor recreation opportunities in a primitive setting.

Management Standards for Wild River Areas

Allowable management practices might include construction of minor structures for such purposes as improvement of fish and game habitat; grazing; protection from fire, insects, or disease; and rehabilitation or stabilization of damaged resources, provided the area will remain natural appearing and the practices or structures are compatible and in harmony with the environment. Developments such as trail bridges, occasional fencing, natural-appearing water diversions, ditches, flow measurement or other water management devices, and similar facilities may be permitted if they are unobtrusive and do not have a significant direct and adverse effect on the natural character of the river area. The following program management standards apply:

1. **Forestry Practices:** Cutting of trees will not be permitted except when needed in association with a primitive recreation experience (such as clearing for trails) and for visitor safety or to protect the environment (such as control of fire). Timber outside the boundary, but within the visual corridors should, where feasible, be managed

and harvested in a manner to provide special emphasis to visual quality.

2. **Hydroelectric Power and Water Resource Development:** No development of hydroelectric power facilities would be permitted. No new flood control dams, levees, or other works are allowed in the channel or river corridor. All water supply dams and major diversions are prohibited. The natural appearance and essentially primitive character of the river area must be maintained. Federal agency groundwater development for range, wildlife, recreation or administrative facilities may be permitted, if there are no adverse effects on river related Outstandingly Remarkable Values.
3. **Mining:** New mining claims and mineral leases are prohibited on Federal lands constituting the river bed or bank or located within 1/4 mile from the ordinary high water mark on both sides of the river. Valid existing claims would not be abrogated and, subject to existing regulations (e.g., 43 CFR 3809) and any future regulations that the Secretary of the Interior may prescribe to protect the rivers included in the W&SR System, existing mining activity would be allowed to continue. All mineral activity on Federally administered land must be conducted in a manner that minimizes surface disturbance, water sedimentation, pollution, and visual impairment. Reasonable mining claim and mineral lease access will be permitted. Mining claims, subject to valid existing rights, within the wild river area boundary can be patented only as to the mineral estate and not the surface estate (subject to proof of discovery prior to the effective date of designation).
4. **Road and Trail Construction:** No construction of new roads, trails, or other provisions for overland motorized travel would be permitted within the river corridor. A few inconspicuous roads or unobtrusive trail bridges leading to the boundary of the river area may be permitted.
5. **Agricultural Practices and Livestock Grazing:** Agricultural use is restricted to a limited amount of domestic livestock grazing and hay production to the extent practiced prior to designation. Row crops are prohibited.
6. **Recreation Facilities:** Major public-use areas, such as campgrounds, interpretive centers, or administrative headquarters are located outside wild river areas. Simple comfort and convenience facilities, such as toilets, tables, fireplaces, shelters and refuse containers may be provided as necessary within the river area. These should harmonize with the surroundings. Unobtrusive hiking and horseback riding trail bridges could be allowed on tributaries, but would not normally cross the designated river.
7. **Public Use and Access:** Recreation use including, but not limited to, hiking, fishing, hunting, and boating is encouraged in wild river areas to the extent consistent with the protection of the river environment. Public use and access may be regulated and distributed where necessary to protect and enhance wild river values.
8. **Rights-of-Way:** New transmission lines, natural gas lines, water lines, etc., are discouraged unless specifically authorized by other plans, orders or laws. Where no reasonable alternate location exists, additional or new facilities should be restricted to existing rights-of-way. Where new rights-of-way are unavoidable, locations and construction techniques will be selected to minimize adverse effects on wild river area related values and fully evaluated during the site selection process.
9. **Motorized Travel:** Motorized travel on land or water could be permitted, but it is generally not compatible with this river classification. Normally, motorized use will be prohibited in a wild river area. Prescriptions for management of motorized use may allow for search and rescue and other emergency situations.
10. **Instream Flow Assessment:** To the extent practical and consistent with resource management objectives, instream flows sufficient to meet the purposes of the designated WSR river should be protected and enhanced if possible. Based on the results of an instream flow assessment, implement flow protection strategies and actions that incorporate legal, technical, and administrative aspects in order to secure instream flow protection for applicable river segments. Protection strategies should be addressed and incorporated in river management plans.

Management Objectives Common to Wild, Scenic, and Recreational Rivers

Fire Protection and Suppression: Management and suppression of fires within a designated river area will be carried out in a manner compatible with contiguous Federal lands. On wildfires, suppression methods will be utilized that minimize long-term impacts on the river and river area. Presuppression and prevention activities will be conducted in a manner which reflects management objectives for the specific river segment. Prescribed fire may be used to maintain or restore ecological condition or meet objectives of the river management plan.

Insects, Diseases and Noxious Weeds: The control of forest and rangeland pests, diseases and noxious weed infestations will be carried out in a manner compatible with the intent of the Act and management objectives of contiguous Federal lands.

Cultural Resources: Historic and prehistoric resource sites will be identified, evaluated and protected in a manner compatible with the management objectives of the river and in accordance with applicable regulations and policies. Where appropriate, historic or prehistoric sites will be stabilized, enhanced, and interpreted.

Water Quality: Water quality will be maintained or improved to meet Federal criteria or Federally approved state standards. (River management plans shall prescribe a process for monitoring water quality on a continuing basis.)

Fish and Wildlife Habitat Improvement: The construction and maintenance of minor structures for the protection, conservation, rehabilitation or enhancement of fish and wildlife habitat are acceptable provided they do not affect the free flowing characteristics of the Wild and Scenic River, are compatible with the river's classification, that the area remains natural in appearance and the practices or structures harmonize with the surrounding environment.

Water Rights: In the process of evaluating river segments, authorizing officials are held to established principles of law with respect to water rights. Under provisions of Section 13 of the Act, as well as other statutes, river studies shall not interfere (except for licenses under Section 7(b) of the Act, pertaining to Section 5(a) Wild and Scenic River studies) with existing rights, including the right of access, with

respect to the beds of navigable streams, tributaries, or river segments. In addition, under the Federal Land Policy and Management Act and the Federal Power Act, the BLM has conditioning authority to control any proposed projects which would be incompatible or potentially degrading to river and/or other identified resource values.

Oregon Scenic Waterways Act

In 1969 the State of Oregon passed the Oregon Scenic Waterways Act. This legislation established a program that protects designated rivers throughout Oregon and is administered by the Oregon Department of Parks and Recreation. Its goals are to protect the free-flowing character of designated rivers for fish, wildlife, and recreation. Dams, reservoirs, impoundments, and placer mining are prohibited on state scenic waterways. The Act requires review of new development along designated rivers. It does not affect existing water rights, development or uses.

Management Constraints on Private Lands

Designation of a river under the Wild and Scenic Rivers Act gives the Federal government no authority to regulate or zone private lands. Land use controls on private lands are solely a matter of State and local zoning regulations. Although the Wild and Scenic Rivers Act includes provisions encouraging the protection of river values through State and governmental land use planning, these provisions are not binding on local governments. The Federal government is responsible for assuring that designated rivers are managed in a manner which meets the intent of the Wild and Scenic Rivers Act.

River management plans may prescribe land use or development limitations to protect a river's Outstandingly Remarkable Values. Many uses may be compatible with a wild, scenic, or recreational classification as long as the rivers are administered so as to protect and enhance the values which caused them to be included in the national system. Most existing uses and activities on adjoining private lands may continue. Timber harvest activities on private lands within a Wild and Scenic River boundary would continue to be regulated by the Oregon Forest Practices Act.

The primary consideration in any river or land use limitation would be the protection and enhancement of a designated river's Outstandingly Remarkable

Value(s). BLM will work closely with landowners to assure that all uses will be consistent with the intent of the Wild and Scenic Rivers Act. Those uses that clearly threaten identified Outstandingly Remarkable Values would be addressed on a case-by-case basis.

Specific management goals for new building, other structure or road construction on private lands along designated rivers would be addressed through the individual river management plans. Federal guidelines allow different degrees of development along rivers classified as wild, scenic, or recreational. In consultation with landowners involved, every effort would be made to reduce adverse impacts to an acceptable level on proposals for major up-grading, realignment and/or new construction of roads. Maintenance of existing roads would generally not alter a river's condition and thus would not be restricted.

On designated rivers, BLM could negotiate with a landowner to purchase specific development rights necessary to prevent any threat to the river's identified Outstandingly Remarkable Values if all other efforts fail to reduce anticipated adverse impacts to an acceptable level. Another option, where mutually agreeable, would be a land exchange providing the private landowner with comparable lands outside the administrative boundary of a river.

The Wild and Scenic Rivers Act specifically prohibits the use of condemnation in the fee title purchase of lands if 50 percent or more of the land within the boundary is already in public ownership. While the Act provides the Federal government with authority to purchase scenic, conservation or access easements through condemnation proceedings, this is considered to be a measure of last resort. In the event condemnation was considered necessary, the

only landowner rights purchased would be those considered necessary to prevent the threat to the river.

If BLM acquires an easement on private land, depending upon its terms and conditions, public access rights may or may not be involved. For example, a scenic easement could only involve the protection of narrowly defined visual qualities with no provisions for public use. A trail or road easement would involve public use provisions. Any provisions for public use of private lands must be specifically purchased from the landowner. BLM would work closely with landowners to minimize public use of nonfederal lands, through brochures, maps, signs and/or other appropriate means, except in locations where rights to such use are acquired.

Wild and Scenic River designation does not affect a private landowner's rights to control trespass. Landowners can charge a fee for crossing private lands to fish designated rivers except where a public access easement exists. The designation of a river into the National Wild and Scenic Rivers system does not change landowner rights unless all or a portion of these use rights are acquired from the landowner.

On navigable rivers, the river bed and banks to the mean high water mark are state lands and are available under state laws for public use. Private landowners control public access to their property along the banks of non-navigable rivers. The designation of a river into the National Wild and Scenic Rivers system has no bearing upon the determination of navigability.

Ownership and use of valid water rights are not affected by a Wild and Scenic River designation.

Appendix Q

Wild and Scenic River Eligibility and Classification Determinations

The first step in proposing additional rivers to the National System is to determine if the river is eligible. To qualify, a river must meet two criteria; (1) be free flowing and (2) have at least one outstanding remarkable value. These values are stated in the Wild and Scenic Rivers Act as, "scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values". The Rivers Act did not specifically spell out the criteria to judge these values. The BLM Westside Oregon Bureau Districts developed criteria (written up in Instruction Memorandum OR-89-632) which, in part, follows:

"A river's scenic, recreational, geologic, fish, wildlife, cultural, and/or historic value(s) are deemed "outstandingly remarkable" if one or more of the following guidelines apply to the value(s) under consideration.

Scenic - The landscape elements of landform, vegetation, water, color, influence of adjacent scenery, scarcity, and cultural modifications are unique and harmonious. The rating area must be scenic quality "A" as defined in the Visual Resource Inventory Handbook, H-8410-1, Illustrations 1 and 2 (included with this attachment). When analyzing scenic values, additional factors such as seasonal variations in vegetation, scale of cultural modifications, and length of time negative intrusions are viewed may be considered. Scenery and visual attractions may be highly diverse over the majority of the river or river segment length and not common to other rivers in the geographic region.

Recreational - Recreational opportunities are or have the potential to be unique enough to attract visitors from outside the geographic region. Visitors would be willing to travel long distances to use the river resources for recreational purposes. River-related opportunities could include, but not be limited to, sightseeing, wildlife observation, photography, hiking, fishing, hunting, and boating.

Interpretive opportunities may be exceptional and attract or have the potential to attract visitors from outside the geographic region.

The river may provide or have the potential to provide settings for national or regional commercial usage or competitive events.

Geologic - The river or the area within the river corridor contains an example(s) of a geologic feature, process, or phenomena that is rare, unusual, one-of-a-kind or unique to the geographic region. The feature(s) may be in an unusually active state of development, represent a "textbook" example and/or represent a unique or rare combination of geologic features (erosional, volcanic, glacial, and other geologic structures).

Fish - Fish values may be judged on the relative merits of either fish populations or habitat - or a combination of these river-related conditions:

Populations - The river is nationally or regionally one of the top producers or resident and/or anadromous fish species. Of particular significance is the presence of wild or unique stocks, or populations of federally listed or candidate threatened and endangered species.

Habitat - The river provides exceptionally high quality habitat for fish species indigenous to the region. Of particular significance is habitat for federally listed or candidate threatened and endangered species.

Wildlife - Wildlife values may be judged on the relative merits of either wildlife populations or habitat - or a combination of these conditions:

Populations - The river or river area within the river corridor contains nationally or regionally important populations of indigenous wildlife species dependent on the river environment. Of particular significance are species considered to be unique or populations or federally listed or candidate threatened and endangered species which are so dependent.

Appendix Q

Habitat - The river or area within the river corridor provides a principal food source, unique habitation site, or migration route for wildlife of national or regional significance, or for a federally listed or candidate threatened and endangered species. Contiguous habitat conditions are such that the biological need of the species are met.

Cultural - The river or area within the river corridor contains a site(s) where there is evidence of occupation or use by native Americans. Sites must be rare, one-of-a-kind, have unusual characteristics or exceptional human interest value(s). Sites may have national or regional importance for interpreting prehistory; may be rare and represent an area where a culture or cultural period was first identified and described; may have been used concurrently by two or more cultural groups; or may have been used by cultural groups for rare or sacred purposes.

Historic - The river or area within the river corridor contains a sites(s) or feature(s) associated with a significant event, an important person, or a cultural activity of the past that was rare, unusually or one-of-a-kind in the region. A historic site(s) and/or feature(s) in most cases is 50 years old or older. Of particular significance are sites or features listed in, or are eligible for inclusion in, the National Register of Historic Places.

Other Similar Values - While no specific evaluation guidelines have been developed for the "other similar values" category, it is assumed that districts will assess additional river-related values not covered in this attachment in a manner consistent with the foregoing guidance - including, but not limited to hydrologic, ecologic/biologic diversity, paleontologic, botanic, and scientific study opportunities."

After determining if a river segment is eligible for inclusion in the National Wild and Scenic River System, the next step in reviewing a potential river is to determine the potential classification. This is based on the condition of the river and the adjacent lands as they exist at the time of the study. Section 2 (b) of the Wild and Scenic Rivers Act provides three classifications. They are:

Wild - Those rivers or sections of rivers that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted. These represent vestiges of primitive America.

Scenic - Those rivers or sections of rivers that are free of impoundments, with shorelines or watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads.

Recreational - Those rivers or sections of rivers that are readily accessible by road or railroad, that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past.

The Federal Register, Vol. 47, No. 174, September 7, 1982, gives guidance for classifying rivers. It states that water quality, water resources development, shoreline development and accessibility are the criteria to be considered when determining classification. Each criterion is important, but their collective intent is more important. The basis for classification is the degree of naturalness of the river. The most natural rivers will be classified wild while the least natural rivers will be recreational.

Table Q-1 further defines the four criteria.

Table Q-1. Classification Criteria for Wild, Scenic, and Recreational Rivers

Attribute	Wild	Scenic	Recreational
Water Resources Development	Free of impoundment.	Free of impoundment.	Some existing impoundments or diversion. The existence of low dams, diversions or other modifications of the waterway is acceptable, provided the waterway remains generally natural and riverine in appearance.
Shoreline Development	Essentially primitive. Little or no evidence of human activity.	Largely primitive and undeveloped. No substantial evidence of human activity.	Some development. Substantial evidence of human activity.
	The presence of a few inconspicuous structures, particularly those of historic or cultural values, is acceptable.	The presence of small communities or dispersed dwellings or farm structures is acceptable.	The presence of extensive residential development and a few commercial structures is acceptable
	A limited amount of domestic livestock grazing or hay production is acceptable.	The presence of grazing, hay production, or row crops is acceptable.	Lands may have been developed for the full range of agricultural and forestry uses.
	Little or no evidence of past timber harvest. No ongoing timber harvest.	Evidence of past or ongoing timber harvest is acceptable, provided the forest appears natural from the riverbank.	May show evidence of past and ongoing timber harvest.
Water Quality	Meets or exceeds Federal criteria or federally approved State standards for aesthetics, for propagation of fish and wildlife normally adapted to the habitat of the river and for primary contact recreation (swimming) except where exceeded by natural conditions.	No criteria is prescribed by the Wild and Scenic Rivers Act. The Federal Water Pollution Control Act Amendments of 1972 have made it a national goal that all waters of the United States be made fishable and swimmable. Therefore, rivers will not be precluded from scenic or recreational classification because of poor water quality at the time of their study, provided a water quality improvement plan exists or is being developed in compliance with applicable Federal and State laws.	
Accessibility	Generally inaccessible except by trail. No roads, railroads, or other provisions for vehicular travel within the river area. A few existing roads leading to the boundary of the river area is acceptable.	Accessible in places by road. Roads may occasionally reach or bridge the river. The existence of short stretches of conspicuous or longer stretches of inconspicuous roads or railroads is acceptable.	Readily accessible by road or railroad. The existence of parallel roads or railroads on one or both banks as well as bridge crossings and other river access points is acceptable.

Appendix R

Wild and Scenic Rivers

Suitability Assessments

This appendix contains suitability assessments for two of five river segments (Canton Creek and Smith River) previously found eligible for inclusion in the National Wild and Scenic Rivers System (NWSRS). The three river segments found eligible but not assessed for suitability did not meet minimum suitability requirements. The primary reason for not assessing suitability on these segments is because BLM does not administer sufficient control, generally considered to be at least 40 percent of the study segment, to protect the values which made the rivers eligible. This introduction to the individual suitability assessments, in addition to general background material, contains information on potential land acquisition, public involvement, suitability criteria, and comparative river segment quality that applies to each assessment.

The analysis of a river's potential for designation under the National Wild and Scenic Rivers Act involves three separate steps: determination of eligibility, classification, and suitability. Rivers or river segments can be classified as wild, scenic, or recreational river areas. Final designation decisions are made by Congress.

To be eligible for designation a river or river segment must be free-flowing and possess at least one outstandingly remarkable value. Eligibility and potential classification decisions were previously made in the planning process. These documents are on file at the Roseburg District Office. Appendix Q contains eligibility and classification criteria used in that process. All river segments included in this appendix are within state comprehensive outdoor recreation (SCORP) region 9. Six streams were reviewed to fulfill analysis requirements for eligibility determination. A summary of eligibility and highest potential classification is shown in Chapter 3, Table 3-29. Suitability findings by alternative are described in Chapter 2.

Criteria specified in section 4(a) of the Wild and Scenic Rivers Act provides a basis for suitability assessment. These criteria are specifically addressed in the individual suitability assessments and are as follows:

1. The characteristics that do or do not make the area a worthy addition to the system.
2. The current status of land ownership and use in the area.
3. The reasonably foreseeable potential uses of the land and water which would be enhanced, foreclosed, or curtailed if the area were included in the National Wild and Scenic River System.
4. The federal agency which should administer the river.
5. The extent to which the costs thereof would be shared by state and local agencies.
6. And, the estimated cost to the United States of acquiring necessary land and interest in land and of administering the area, should it be added to the system.

In the Analysis of the Management Situation summary we stated a separate Legislative Environmental Impact Statement (LEIS) would be prepared for river or river segments found suitable for designation as a component of the NWSRS. The LEIS would have been the method of forwarding the findings and recommendations to Congress. However, we have now decided that this RMP/EIS will serve as the only EIS analyzing suitability findings and whatever recommendations are made later for inclusion in the system.

For river segments found eligible but not assessed for suitability and those assessed and found suitable, all BLM-administered land within one-quarter mile on either side of the river segments will be afforded a level of interim management necessary for protection of identified outstanding remarkable values. This interim management will continue until a final determination is made.

The federal government does not manage private land within designated wild, scenic, or recreational rivers areas and has no zoning authority over these lands under the Act. The federal government's authority to affect private lands is primarily through the acquisition authorities conferred in the Wild and

Scenic Rivers Act. Except for the acquisition of land or interest in lands, for which just compensation is made, the agencies cannot regulate the use of private property via this law. Section 6Ob) of the Wild and Scenic Rivers Act prohibits federal condemnation to purchase fee title lands when fifty percent or more of a designated river corridor is public land (federal, state, county, etc.). However, section 6Ob) does allow the use of condemnation to purchase scenic easements as a measure of last resort to remove or prevent a threat to the river or its Outstandingly Remarkable Values.

Private land ownership is legitimate within designated river boundaries, and existing private land uses are often consistent with wild, scenic, or recreational rivers management goals. Carefully conducted ranching, farming, mining, and forest management activities within the "Scenic" and "Recreational" river classifications may continue. Assistance to private landowners may be provided by the federal government to encourage practices that enhance the river's natural values, e.g., water quality and quantity, streambank stability and riparian habitat.

There has been minimal public interest concerning the suitability of rivers found eligible for potential designation. A concern was expressed about the process used for suitability determination, and how the analysis was to be made.

Based on planning criteria in the State Director's guidance for formulation of planning alternatives (see Appendix B), BLM made a comparison of

outstandingly remarkable values associated with each eligible river segment in each SCORP region. Rivers were found suitable for designation in the NWSRS in the different alternatives based on whether one or more of its Outstandingly Remarkable Values were ranked at the top four (Alternative D), top two (Alternative C), or top one (Alternative B) river(s) in its SCORP region. Rivers that are already included in the NWSRS were ranked equally as being among the top river(s) in the SCORP region.

Four designated rivers (the Rogue, upper Rogue, Illinois, and North Umpqua) and one Congressionally-mandated study river (the upper Klamath) flow through SCORP Region 9. Therefore, the Outstandingly Remarkable Values associated with those rivers were ranked above those on non-designated rivers. The top four river areas per Outstandingly Remarkable Value, shown in Table R-1, are listed below, with the top river(s) listed first. Fish was the sole Outstandingly Remarkable Value identified for both Canton Creek and Smith River. Neither segments ranked in the top four in the SCORP region for this Outstandingly Remarkable Value.

The following two suitability assessments contain a summary which identifies the river segment and the findings followed by a more detailed description of the river and other factors considered in the suitability determination.

Table R-1. Ranking of Outstandingly Remarkable Values in Region 9

River Segment	Rec.	Geol.	Fish	Wildlife	Scn.	Cult.	Hist.	Other ¹
Rogue ²	X		X	X	X		X	
Illinois	X		X	X	X			X
Klamath ³	X		X	X	X	X	X	X
N. Umpqua ²	X		X		X			X
Upper Rogue ²		X		X				X
Smith River			X					
Canton Creek			X					

¹Other (water quality, hydrological, botanical, vegetation, ecological, biological, and diversity).

²River segments previously designated.

³The river Klamath ranks in the top one or two rivers for cultural, historic, and other ORVs.

Smith River

findings and BLM's fifty-five percent administrative jurisdiction along the one-half mile river corridor.

I. Summary

The 17.5 mile segment of Smith River from the confluence with the South Fork of Smith River to the western boundary of the district was studied to determine suitability for designation as a recreational river under the National Wild and Scenic Rivers Act.

II. Background

A. Description of the River

Smith River is a principal tributary of the Umpqua River. The Roseburg district office identified as eligible a 17.5 mile segment of Smith River from the confluence with the South Fork of Smith River, located in section 31, T.20S., R.6W., W.M. to the western boundary of the district in section 6, T.21 S., R.7 W., W.M.

Smith River provides important spawning and rearing habitat for anadromous fish species.

There are no campgrounds or hiking trails within the segment. Recreational opportunities for water sports are limited due to the stream morphology and limited flows. Newman Hole, a swimming area that gets very limited use by local residents, is within the study segment. Access to the river for recreational use is limited due to the steep banks and thick vegetation.

Portions of the study segment, a one-half mile corridor (one-quarter mile on each side of the stream), have been clearcut while other parts have old-growth coniferous forests. A County and BLM road parallels the river the entire length of the study area.

B. Eligibility Determination

Smith River is free-flowing within the 17.5 mile study segment. Resident and anadromous fish are the single outstandingly remarkable value identified through eligibility assessment. This segment supports several native stocks of species of fish including; fall chinook salmon, coho salmon, winter steelhead, resident cutthroat trout, and sea run cutthroat trout. This suitability assessment was prepared based on these

C. Classification Determination.

The river's highest potential classification is recreational as shown below. The river is free of any impoundments or diversions, however minor streambank modification has occurred from riprap placement and construction of bridge abutments. The Scenic Quality Class is C (low) and VRM Management Class on the available forest land would be VRM class IV if the river is found nonsuitable for Wild and Scenic status. The nonavailable forest land would be classified as it is inventoried - VRM III. If the river is found suitable, on the other hand, the entire corridor would be classified as inventoried - that is VRM III.

Under VRM IV management, landscape alterations may dominate the view and may be the major focus of viewer attention. The scenic quality of the area may be significantly modified. Under VRM III management, landscape alterations may attract attention, but should not dominate the view, and scenic quality should be partially retained. Water quality and quantity is fair and supports the corridor's outstandingly remarkable value of fisheries.

The river is accessible from Douglas County Road No. 37 and Smith River Road (BLM road No. 21-7-27.0). These roads parallel the river for the entire length of the study segment and cross the river at two separate locations. The roads are primarily used for logging and recreational activities. Traffic can be heard from most portions of the river and the road is noticeable from the river throughout most of the study segment.

III. Suitability Factors

A. Current Land Status and Use

1. Land Ownership

The Roseburg BLM district administers 9.6 stream miles which is 55 percent of the river segment. Land ownership status within the study segment is shown in Table R-3.

Table R-2. Smith River Potential Classification Summary

Activity	Wild	Scenic	Recreational
Water resources development	M ¹	M	M
Shoreline development	DM ²	DM	M
Water quality	M	M	M
Accessibility	DM	DM	M

¹M: Meets²DM: Does not meet

2. Land Use

The main land use within the study segment is general forestry operations. On the private land within the corridor most of the original forest land has been harvested within the last 25 years. These lands are now young conifer plantations. There has been timber harvesting on the O&C lands within the corridor. A minor amount of livestock grazing and agricultural activities occur within the corridor.

Historically, there has been minor residential development within the corridor. Douglas County has zoned the river corridor as timberlands, which restricts further subdivision of the private land for other than forest management activities and prevents residential development. Forestry practices on private land within the corridor are regulated by the State of Oregon under the Forest Practices Act.

As of May 15, 1992, there is one existing placer mining claim located within the corridor. No federal mineral leases are in effect. The study area is open to competitive lease for oil and gas. Most of the area is withdrawn for water power designation and power site reserves. No existing or proposed power line corridors were identified in the 1991 Western Regional Corridor study.

Table R-3. Smith River Segment Ownership and Status Within the River Corridor

Ownership	Land Base Acres	Percent Ownership
BLM		
Public Domain	0	
O&C Lands	2,312	55
Forest Service	0	
State	0	
County	0	
Aaron U. Jones	1,484	36
International Paper	327	8
Private Individuals	38	1
Total	4,161	100

B. Reasonable Foreseeable Uses of the Land and Water Which May be Affected by Designation.

1. Recreation

Designation of Smith River as a Wild and Scenic River may draw additional people to this drainage. However, recreational opportunities are limited. Swimming in Smith River is not a high use recreation activity now, and it is not likely that a drastic increase in this use would occur. Increased visitor use of the Smith River drainage could necessitate additional facility development in the future (ie. restroom facilities, off-road parking, day use area, and interpretive facilities) to accommodate this increase of visitor use.

2. Timber

The recreational classification would not restrict timber harvest on federal land within the study segment beyond the restrictions proposed in the Resource Management Plan. Designation would not further restrict the timber harvest on the private lands within the study segment.

3. Mining

The Geology of the area indicates a very low potential for locatable mineral deposits and there is no historic record of any past or current mineral activity in the study segment. Section 9 (b) of the Wild and Scenic Rivers Act states that only lands within the boundary designated "wild" are withdrawn from mineral entry. Designation as "recreational" would have no effect toward enhancing, foreclosing, or curtailing mineral activity.

Powers Act requires FERC to consider consistency with federal or state comprehensive plans for improving, developing, or constructing a waterway prior to issuing licenses. Licensing by FERC is restricted because of inconsistency with the NPPC "protected area" designation. Designation would give congressional protection from hydroelectric development of the study segment, however development is essentially foreclosed already under current regulations.

4. Hydroelectric

Based on data from Oregon State University's Water Resources Research Institute's (WRRRI) 1979 study, "A Resource Survey of River Energy and Low-Head Hydroelectric Power Potential in Oregon" hydroelectric power potential for this segment of Smith River would be:

$$P = (0.08475) (Q) (H) (1.0) = 2400 \text{ kilowatts}$$

P = power (kilowatts)

Q = streamflow (cuft/sec)

H = head (feet)

This value is based on assumption of complete utilization of the entire river reach, use of all the water available, and 100 percent operating efficiency of the hydroelectric plant. The WRRRI study also identifies "special fish problems" as a feasibility restraint on this segment.

There are no Federal Energy Regulatory Commission (FERC) applications for irrigation, or proposals for dams or diversions on file for this river segment. This segment has been identified by the Northwest Power Planning Council (NPPC) as a "protected area" for hydroelectric development.

Designation of the segment would restrict FERC from licensing construction of new federally built, permitted, or licensed dams plus other resource projects which would have a direct adverse effect on the free flowing values of the stream. However Section 10 (a) of the Federal

5. Wildlife

The study segment provides a variety of habitat types along Smith River, as a result animal life in the segment is fairly diverse.

Several of the species that may occur in the suitable habitat in the study segment are considered as sensitive by the State Department of Fish and Wildlife and are included on their critical species list, or are listed as federal threatened, or as candidates by the Federal Government. These are: Northern Spotted Owl, Mountain Quail, Northern Goshawk, Pileated Woodpecker, White-Footed Vole, Townsend's Big Eared Bat, Marbled Murrelet, Northwestern Pond Turtle, Foothills Yellow-Legged Frog, Northern Red-legged Frog, and Clouded Salamander.

Designation of the segment as recreational under the Wild and Scenic Rivers Act would have little effect on the consideration given for wildlife utilizing habitat in the study segment. Species listed under federal law would be managed according to the Endangered Species Act, which is more stringent than the Wild and Scenic Rivers Act. Species listed by the State of Oregon would be protected under bureau policy regulating activities that affect those species on bureau lands. Designation would not preclude forest management activities addressed in the proposed Resource Management Plan.

6. Fisheries

Smith River serves as spawning and rearing habitat for several anadromous and resident fish. None of the fish species inhabiting Smith River have been classified as threatened or endangered, however populations of wild coho salmon and searun cutthroat trout are depressed and may be declining. Coho salmon, winter steelhead, and searun cutthroat trout are the anadromous salmonid species which utilize the stream during part of their life cycle. Resident trout using the river include cutthroat, rainbow, brook, and brown trout. Additional species include suckers, dace, and redbreast shiners. Effects of designation on fisheries is discussed in more detail in the next section "Effects on the Outstandingly Remarkable Values".

7. Private Lands

The private lands within the study segment would not be affected by designation. Since the federal land ownership within the study segment exceeds 50 percent of the land base land acquisition of private lands by condemnation would be prohibited. Land acquisition and easements could be acquired from willing landowners. The private lands are zoned timberlands which restricts further subdivision.

D. Effects on Outstandingly Remarkable Values

The fisheries values currently within the study segment are primarily a reflection of the total watershed condition within the Smith River Basin. Stream conditions have been determined by events and actions which have taken place in the upper reaches of the watershed. The one-half mile corridor contributes only a small amount towards the stream conditions which support the fisheries values that are found within the stream study segment. The main road paralleling the river in this stretch impacts fishery habitat with increased sedimentation and a loss of riparian vegetation. The road and the associated impacts would not change if the study segment were designated.

Current management practices on Bureau lands attempt to minimize downstream

impacts to fisheries values within the stream system. Instream projects have also been undertaken to mitigate, restore, or enhance favorable conditions for fisheries within the main stem and tributaries of the Smith River system.

If the study segment is designated under the Wild & Scenic Rivers Act little, if any, of the current land management practices now in place would change. Designation would only apply to the study segment along Smith River and would not consider the areas of principal importance outside the half mile corridor. Designation would preclude hydroelectric development but would allow mining, timber harvest and recreational use to continue essentially at present levels. The benefit to the Outstandingly Remarkable Value, fisheries, would be negligible.

E. How the River Segment Would Be Managed if it Were Not Designated

If the river were not added to the National Wild and Scenic Rivers System, the BLM would continue to manage the land under its jurisdiction within the study segment with continuing emphasis on protection of the riparian values. The Outstandingly Remarkable Value of fisheries would be protected by such management.

Special consideration will be given to the management of riparian zones and water quality in all drainages of the Roseburg District under the Preferred Alternative of the Resource Management Plan. Protection of Riparian Management Areas (RMA) will be attained by buffers of varying width depending upon the order of the stream. Third, fourth, fifth, and sixth order and greater streams will receive buffers of 105, 150, 210, and 240 feet on either side of the stream. This translates to approximately 25.5 acres/mile for third order streams. For 4th, 5th, and 6th order streams, the equivalent acres per mile are 36.4, 50.9 and 58.2.

The study segment of Smith River is a seventh order stream and would receive a buffer of 240 feet on both sides of the river. In addition, all first and second order perennial water in the drainage would be protected through creation of riparian management areas with an average width of 75 feet on each side of the stream with a minimum

width of 50 feet as proposed in the Resource Management Plan.

The BLM will continue to work cooperatively with other agencies including the Oregon Department of Fish and Wildlife and private land owners to enhance the fisheries Outstandingly Remarkable Value in Smith River and to provide sound riparian management on all lands along the stream reach.

The Resource Management Plan identifies the Smith River drainage as an "avoidance area" restricting rights-of-way grants for hydro power development in the area.

F. Cost of Administration

An estimated cost of \$300,000 would be associated with the designation of Smith River as a Wild and Scenic River. There would be two types of costs involved: 1) start up, non reoccurring cost; and 2) annual maintenance costs which could be expected year after year. Start up costs are estimated at \$280,000 and would involve the following items: 1) Development of the River Management Plan, 2) New facility development, 3) Water monitoring analysis, 4) Land acquisition, 5) Fish enhancement project work, and 5) Boundary survey and posting. The recurring annual costs are estimated to be \$19,000 and these costs would be associated with : 1) Law enforcement, 2) Facility maintenance, 3) ongoing water monitoring and 4) fish habitat structure maintenance. If the decision were made to acquire private lands from willing sellers by purchase rather than exchange this cost could double.

G. Administering Agency

If Smith River were added to the National Wild and Scenic Rivers System, the BLM would continue to manage the land and resources it currently administers.

IV. Finding and Rationale

A. Finding

The 17.5 mile segment of Smith River from the confluence with the South Fork of Smith River to the western boundary of the district was found to be unsuitable for designation as

a recreational river under the National Wild and Scenic Rivers Act.

The BLM'S intent in the preferred alternative of the Draft RMP/EIS to protect the Outstandingly Remarkable Value on BLM-administered land indicate that designation will not be needed to protect this value. Current and proposed land management activities continue to recognize the value of Smith River fisheries and will be applied across the watershed, not just the main stem as would be designated under the Wild and Scenic Rivers Act. The Outstandingly Remarkable Value is not threatened by dam construction or irrigation development. On Private land, the Oregon Forest Practices Act is designed to protect the fisheries from impacts associated with timber management activities.

Most parties are in favor of protection of the fisheries Outstandingly Remarkable Value. Considering all the factors, BLM believes the river segment's Outstandingly Remarkable Value can best be protected by a combination of actions set forth in the preferred alternative of this Draft RMP/EIS and by the management of private land consistent with county zoning and state law.

Canton Creek

I. Summary

The 10.7 mile segment of Canton Creek from the USFS boundary upstream to Tin Cup Creek was studied to determine suitability for designation as a recreational river under the National Wild and Scenic Rivers Act.

II. Background

A. Description of the Stream

Canton Creek is part of the Steamboat drainage which is a principal tributary of the North Umpqua River. The Roseburg District Office identified as eligible a 10.7 mile segment of Canton Creek from the U.S. Forest Service boundary between sections 31 and 36, T.25 S., R.1 E. and R.1 W. W.M. to the confluence with Tin Cup Creek in section 24, T.24 S., R.1 W. W.M.

Canton Creek provides important spawning and rearing habitat for anadromous fish species and is managed primarily for that purpose. The stream has been closed to all angling since 1932, by the State of Oregon, to protect fisheries values.

There is one low standard campground within the segment, no trails for hiking and water sport recreation is not practicable due to the stream morphology and limited flows. The main recreational use of this stream is swimming, however this use is relatively minor. Access to the stream for recreational use is limited due to the steep banks and thick vegetation.

Portions of the study segment, a one-half mile corridor (one-quarter mile on each side of the stream), have been clearcut while other parts have old-growth coniferous forests. An asphalt BLM road parallels the creek the entire length of the study area.

Prior to 1970 management on public and private lands as well as natural events contributed to the historical condition of Canton Creek and resulted in degradation of fisheries habitat. However, changes in land management practices and forest practice laws have resulted in the recovery of stream side management areas improving water quality. S. W. Hostetler 1991 study, "Analysis and modeling of long-term stream temperatures on the Steamboat Creek Basin, Oregon: implications for land use and fish habitat" indicates a downward trend in summer stream temperatures in Canton Creek. Steve Holaday's graduate work further collaborates this trend and his data demonstrates that stream temperatures are cooling as a reflection of recovery by riparian habitat vegetation in Canton Creek.

B. Eligibility Determination

The legislative history of the Omnibus Oregon Wild and Scenic Rivers Act of 1988 added Steamboat Creek "to the amendment as a study river to determine whether wild and scenic designation would offer management tools to better protect (the fisheries) value." In addition the committee directed the "Bureau of Land Management to extend fishery management emphasis to the tributaries of Steamboat Creek, including Canton Creek, to optimize fish production,

and including where necessary, increased law enforcement activities."

Canton Creek is free-flowing within the 10.7 mile study segment. Resident and anadromous fish are the single outstandingly remarkable value identified through eligibility assessment. This segment supports several native stocks of different species of fish including; coho and spring chinook salmon, winter and summer steelhead, resident and sea run cutthroat trout. The production of steelhead from this segment is approximately 21 percent of the total produced in the North Umpqua Basin. The North Umpqua River is noted for being one of the top summer steelhead fisheries in the Northwest.

This suitability assessment was prepared based on these findings and BLM's sixty-five percent administrative jurisdiction along the one-half mile stream corridor.

C. Classification Determination.

The stream's highest potential classification is recreational as shown below. The stream is free of any impoundments or diversions, however minor stream-bank modification has occurred from riprap placement and construction of bridge abutments. Past logging activity is visible from the stream and access road throughout most of the segment. The Scenic Quality Class is C (low), sensitivity is low, and Management Class is IV (modification) due to extensive modification of the landscape, based on the district VRM inventory.

Water quality and quantity is not limiting to the corridor's outstandingly remarkable value of fisheries. Additionally water temperature as shown by both Hostetler and Holaday is improving.

The stream is accessible from BLM Road No. 25-1E-31.0 Canton Creek Road and BLM road No. 24-1-26.0 Upper Canton Creek Road. These roads parallel the creek for the entire length of the study segment and cross the stream at four separate locations. The roads are primarily used for logging and recreational activities. Traffic can be heard from most portions of the stream and the road is noticeable from the creek throughout most of the study segment.

Table R-4. Canton Creek Potential Classification Summary

Activity	Wild	Scenic	Recreational
Water resources development	M ¹	M	M
Shoreline development	DM ²	DM	M
Water quality	M	M	M
Accessibility	DM	DM	M

¹M: Meets

²DM: Does not meet

Table R-5. Canton Creek Segment Ownership and Status Within the Stream Corridor

Ownership	Land Base Acres	Percent Ownership
BLM		
Public Domain	0	
O&C Lands	2204	65
Forest Service	0	
State	0	
County	0	
Seneca.	862	25
Menasha	131	4
Roseburg Resources	210	6
Private Individuals	0	
Total	3407	100

III. Suitability Factors

A. Current Land Status and Use

1. Land Ownership

The Roseburg BLM district administers 6.8 stream miles which is 64 percent of the stream segment. Land ownership status within the study segment is shown in Table R-5.

2. Land Use

The main land use within the study segment is general forestry operations. On the private land within the corridor most of the original forest land has been harvested within the last 25 years. These lands are now young conifer plantations. There has been timber harvesting on some of the O&C lands within the corridor. No Livestock grazing or agricultural activities occur within the corridor.

There has been no residential development within the corridor. Douglas County has zoned the stream corridor as timberlands, which restricts further subdivision of the private land for other than forest management activities and prevents residential development. Forestry practices on private land are

regulated by the State of Oregon under the Forest Practices Act.

There are no known mining claims located within the corridor and no federal mineral leases are in effect. There are no utility rights-of-way within or crossing the corridor. A power line right-of-way is located near the study segment along the southern boundary.

For a description of recreation use refer to the Background section of this report.

B. Reasonable Foreseeable Uses of the Land and Water Which May be Affected by Designation.

1. Recreation

Designation of Canton Creek as a Wild and Scenic River would very likely draw additional people to this drainage. However, recreational opportunities are limited. The existing campground would probably get additional use, and some additional associated swimming in the creek could be expected. However, since swimming in Canton Creek is not a high use recreation activity now, it's not likely that a drastic increase in this use would occur. Fishing in Canton Creek has been prohibited since 1932, and this restriction

is not likely to change with designation. Increased visitor use of the Canton Creek drainage could necessitate additional facility development in the future (ie. restroom facilities, off-road parking, day use area and interpretive facilities) to accommodate this increase of visitor use. Accommodation or regulation of this increase use could also occur administratively by discouragement, elimination, or closure of areas. At present, no additional recreation facilities are planned in the drainage.

2. Timber

The recreational classification would not restrict timber harvest on federal land within the study segment beyond the restrictions proposed in this Resource Management Plan. Designation would not further restrict the timber harvest on the private lands within the study segment.

3. Mining

The Geology of the area indicates a very low potential for exploitable mineral deposits and there is no record of any past or current mineral activity in the study segment. Section 9 (b) of the Wild and Scenic Rivers Act states that only lands within the boundary designated "wild" are withdrawn from mineral entry. Designation as "recreational" would have no effect toward enhancing, foreclosing, or curtailing mineral activity.

4. Hydroelectric

Based on data from Oregon State University's Water Resources Research Institute's (WRRRI) 1979 study, "A Resource Survey of River Energy and Low-Head Hydroelectric Power Potential in Oregon" hydroelectric power potential for this segment of Canton Creek would be:

$$P = (0.08475) (Q) (H) (1.0) = 3800 \text{ kilowatts}$$

P = power (kilowatts)

Q = streamflow (cuft/sec)

H = head (feet)

This value is based on assumption of complete utilization of the entire stream reach, use of all the water available, and 100 percent operating efficiency of the hydroelectric plant. The WRRRI study also identifies two feasibility restraints on this segment "land use restrictions" and "special fish problems".

There are no Federal Energy Regulatory Commission (FERC) applications for irrigation, or proposals for dams or diversions on file for this stream segment. This segment has been identified by the Northwest Power Planning Council (NPPC) as a "protected area" for hydroelectric development because of fisheries habitat.

Designation of the segment would restrict FERC from licensing construction of new federally built, permitted, or licensed dams plus other resource projects which would have a direct adverse effect on the free flowing values of the stream. However Section 10 (a) of the Federal Powers Act requires FERC to consider consistency with federal or state comprehensive plans for improving, developing or constructing a waterway prior to issuing licenses. Licensing by FERC is restricted because of inconsistency with the NPPC "protected area" designation. Designation would give congressional protection from hydroelectric development of the study segment, however development is essentially foreclosed under current regulations.

5. Wildlife

The study segment provides a variety of habitat types along Canton Creek and as a result animal life in the segment is fairly diverse.

Several of the species found in the study segment are considered sensitive by the State Department of Fish and Wildlife and are included on their critical species list, or are listed as federal threatened, or as candidates by the federal government. These are: Northern spotted owl, mountain quail, northern goshawk, pileated woodpecker, ringtail, California

mountain kingsnake, northern red-legged frog, and clouded salamander. All of these species have been noted in the study segment. Designation of the segment as recreational under the Wild and Scenic Rivers Act would have little effect on the consideration given for wildlife utilizing habitat in the study segment. Species listed under federal law would be managed according to the Endangered Species Act, which is more stringent than the Wild and Scenic Rivers Act. Species listed by the State of Oregon would be protected under bureau policy regulating activities that affect those species on bureau lands. Designation would not preclude those forest management activities addressed in the proposed Resource Management Plan.

6. Fisheries

Canton Creek serves as spawning and rearing habitat for several anadromous and resident fish. None of the fish species inhabiting Canton Creek have been classified as threatened or endangered, however populations of wild coho and sea run cutthroat trout are depressed and may be declining. Coho salmon, winter and summer steelhead, and sea run cutthroat are the anadromous salmonid species which utilize the stream during part of their life cycle. Resident trout using the stream include cutthroat, rainbow, and brown trout. Additional species include sculpins, suckers, dace, and redbreast shiners. Affects of designation on fisheries is discussed in more detail in the next section "Effects on the Outstandingly Remarkable Values".

7. Private Lands

The private lands within the study segment would not be affected by designation. Since the federal land ownership within the study segment exceeds 50 percent of the land base land acquisition of private lands by condemnation would be prohibited. Land acquisition and easements could be acquired from willing landowners. The private lands are zoned timberlands which restricts further subdivision.

D. Effects on Outstandingly Remarkable Values

The fisheries values currently within the study segment are primarily a reflection of the total watershed condition within the Canton Creek Basin. Stream conditions have been determined by events and actions which have taken place in the upper reaches of the watershed. The one-half mile corridor contributes only a small amount towards the stream conditions which support the fisheries values that are found within the stream study segment.

The value of contributing watersheds on fisheries has long been recognized in the Canton Creek drainage. Management practices on Bureau lands attempt to minimize downstream impacts to fisheries values within the stream system. Instream projects have also been undertaken to mitigate, restore, or enhance favorable conditions for fisheries within the mainstem and upper reaches of the Canton Creek system.

If the study segment is designated under the Wild & Scenic Rivers Act little, if any, of the current land management practices now in place would change. Designation would only apply to the study segment along Lower Canton Creek and would not consider the areas of principal importance outside the half mile corridor. Designation would preclude hydroelectric development but would allow mining, timber harvest, and recreational use to continue essentially at present levels. The benefit to the Outstandingly Remarkable Value, fisheries, would be negligible.

E. How the Stream Segment Would Be Managed if it Were Not Designated

If the stream were not added to the National Wild and Scenic Rivers System, the BLM would continue to manage the land under its jurisdiction within the study segment with continuing emphasis on protection of the riparian values. The Outstandingly Remarkable Value of fisheries would be protected by such management.

Special consideration will be given to the management of riparian zones and water quality in all drainage of the Roseburg District under the PRMP. Protection of Riparian Management Areas (RMA) will be attained by

leaving uncut buffers of varying width depending on the order of the stream. All fish bearing streams will receive buffers of 150 feet minimum either side of the stream. Average buffer widths of 75 feet (50 ft. minimum) would be established for all first and second order perennial streams. Third, fourth, fifth, and sixth order and greater streams will receive buffer widths of 105, 150, 210, and 240 feet respectively on either side of the stream. The study segment of Canton Creek is fifth and sixth order and would receive a buffer of 240 feet from the U.S. Forest Service boundary north to Pass Creek and a buffer of 210 from Pass Creek to Tin Cup Creek.

The lower portion of Canton Creek (approximately 4.0 miles of the study segment) will be managed as a Connectivity Area (CA) under the PRMP. This area will be managed with a rotation age of 125 years. Timber harvest activity would retain 12-16 trees per acre with a management emphasis to regain old-growth characteristics on these lands.

The BLM will continue to work cooperatively with other agencies including the Oregon Dept. of Fish and Wildlife and private land owners to enhance the fisheries Outstandingly Remarkable Value in Canton Creek and to provide sound riparian management on all lands along the stream reach. Additionally an attempt would be made to acquire lands from private landowners to maximize BLM ownership in Canton Creek.

The Resource Management Plan also identifies the Canton Creek drainage as an "avoidance area" restricting rights-of-way grants for hydro power development in the area.

Also, no additional recreational facilities are proposed in the drainage. Law enforcement has already been increased via the hiring of a BLM ranger in 1991.

F. Cost of Administration

An estimated cost of \$330,000 would be associated with the designation of Canton Creek as a Wild and Scenic River. There would be two types of costs involved: 1) start up, non reoccurring cost; and 2) annual maintenance costs which could be expected year after year. Start up costs are estimated at \$300,000 and would involve the following items: 1) Development of the River Management Plan, 2) New facility development, 3) Water monitoring analysis, 4) Land acquisition, 5) Fish enhancement project work, and 5) Boundary survey and posting. The recurring annual costs are estimated to be \$30,000 and these costs would be associated with: 1) Law enforcement, 2) Facility maintenance, 4) ongoing water monitoring, 5) and fish habitat structure maintenance. If the decision were made to acquire private lands from willing sellers by purchase rather than exchange this cost could double.

G. Administering Agency

If Canton Creek were added to the National Wild and Scenic Rivers System, the BLM would continue to manage the land and resources it currently administers.

IV. Finding and Rationale

A. Finding

The 10.7 mile segment of Canton Creek from the USFS boundary upstream to Tin Cup Creek was found to be unsuitable for designation as a recreational river under the National Wild and Scenic Rivers Act.

The BLM'S intent in the PRMP is to protect the Outstandingly Remarkable Value on BLM-administered land indicate that designation will not be needed to protect this value. Current and proposed land management activities continue to recognize

the value of Canton Creek fisheries and will be applied across the watershed, not just the mainstem as would be designated under the Wild and Scenic Rivers Act. The Outstandingly Remarkable Value is not threatened by dam construction or irrigation development. On Private land the requirements of the Oregon Forest Practices Act should protect the fisheries from impacts of timber management.

Public opinion for designation is split, however most parties are in favor of protection of the fisheries Outstandingly Remarkable Value. Considering all the factors, BLM believes the stream segment's Outstandingly Remarkable Value can best be protected by a combination of actions set forth in the PRMP/EIS, though cooperative agreements, and by the management of private land consistent with county zoning and state law.

Appendix S

Special Forest Products

Table S-1. Partial Listing of Existing or Potential Special Forest Products on Roseburg District and Their Possible Uses

EXISTING/POTENTIAL SPECIAL FOREST PRODUCTS	CR	CO	FL	FO	GR	LP	PH	PO
Skunk cabbage							XX	
Western Solomon's plume			XX					
Common cattail	XX		XX	XX	XX		XX	
False-hellebore							XX	
Beargrass	XX				XX		XX	
Eel-grass	XX							
Lady fern					XX	XX		
Deer fern					XX	XX		
Mountain-holly fern						XX		
Parsley-fern				XX		XX		
Common sword fern					XX	XX		
Western bracken fern*					XX			
Leateherleaf fern						XX		
Giant chain fern						XX		
Poison-oak*							XX	
Himalaya blackberry				XX			XX	
Evergreen blackberry				XX				
Trailing blackberry				XX				
Wild cucumber							XX	
Wintergreen salal						XX		XX
Evergreen-huckleberry				XX	XX	XX		
Western red huckleberry				XX		XX		XX
Ground or Vine maple moss					XX		XX	
Foxglove*							XX	
Yarrow			XX	XX	XX	XX	XX	XX
Salal	XX		XX	XX	XX		XX	
Ocean spray			XX					
Coastal black twinberry	XX							
Bayberry			XX				XX	
Woodland beardtongue						XX		
Devil's club						XX		
Oregon boxwood					XX	XX		
Yellow-rose cinquefoil						XX		
Pacific ninebark			XX					
Spreading phlox						XX		
CR - Crafts		CO - Cones	FL - Floral					
GR - Greenery		LP - Live Plants	FO - Food resource					
PO - Potpourri			PH - Pharmaceutical					

* May be poisonous in some forms to humans.

Information on possible uses is from slide presentation by Anthony Walters, Certified Ethnobotanist

Table S-2. Partial Listing of Existing or Potential Special Forest Products on the Roseburg District and Their Possible Uses

EXISTING/POTENTIAL SPECIAL FOREST PRODUCTS	CR	CO	FU	FO	GR	LP	PH	PO
Cascara sagrada			XX					
Fragrant black currant				XX			XX	XX
Fuschia-flowered gooseberry			XX		XX	XX	XX	
Redflowering currant			XX					
Blackcaps			XX		XX			
Thimbleberry			XX		XX			
Salmonberry			XX					
Blue elder			XX		XX			
Red elder			XX					
Orange elder			XX					
Wood-sorrel			XX		XX			
Goldenrod			XX		XX	XX		
Vine maple	XX		XX		XX	XX		
Manzanita			XX	XX				
Large Oregon grape	XX		XX		XX	XX		
Dwarf Oregon grape	XX		XX	XX	XX	XX		
Golden chinquapin			XX	XX				
Prince's pine			XX	XX	XX			
American ginger			XX		XX		XX	
St. John's wort			XX					
Yellow monkeyflower			XX					
Incense-cedar			XX		XX	XX		XX
Port Orford cedar			XX		XX	XX		XX
Alaska yellow cedar			XX		XX	XX		XX
Western red cedar			XX		XX	XX		XX
Sitka spruce	XX	XX	XX		XX	XX		
Western white pine		XX	XX		XX	XX	XX	
Sugar pine	XX	XX	XX	XX		XX	XX	
Ponderosa pine	XX	XX	XX		XX	XX		
Western hemlock		XX	XX		XX	XX		
Red alder	XX	XX	XX	XX	XX	XX		
Pacific dogwood	XX		XX	XX		XX		
Oregon white oak	XX		XX		XX			
Willows	XX		XX		XX	XX		
Douglas-fir		XX	XX		XX	XX	XX	XX
CR - Crafts		CO - Cones		FO - Food resource				
GR - Greenery		LP - Live Plants		PH - Pharmaceutical				
PO - Potpourri		FU - Fuels						

* May be poisonous in some forms to humans.

Information from slide presentation by Anthony Walters, Certified Ethnobotanist

Table S-3. List of Special Forest Products Sold Under Permit During FY87-91

PRODUCT	UNIT OF MEASURE	Roseburg District	
		FY87-91 ISSUED # PERMITS	FY87-91 QUANTITY
SAWTIMBER	MBF	298	1342.6
PULPWOOD	MBF	26	33.5
MARGINAL LOGS	MBF	131	1856.1
BOLTS AND SHAKES	MBF	9	16.5
ARROW STOCK	MBF	1	1.5
CORRAL POLES	MBF	6	4.7
SMALL POLES	MBF	15	43.6
LARGE POLES	MBF	3	1.1
SPLIT RAILS	MBF	2	0.4
LINE POSTS	MBF	34	15.6
CORNER POSTS	MBF	8	1.9
++SUBTOTAL-PROD MEASURED IN MBF++	533	3317.5	
FUELWOOD	CORDS	9577	23,498
++SUBTOTAL-PROD MEASURED IN CORDS++	9577	23,498	
CONES	BUSHEL	1	450
++SUBTOTAL-PROD MEASURED IN BUSHEL++		1	450
CHRISTMAS TREES	NUMBER	3300	3300
WILDINGS*	NUMBER	7	610
++SUBTOTAL-PROD MEASURED INDIVIDUALLY++		3307	3910
CASCARA BARK	POUNDS	0	0
MOSS	POUNDS	1	500
BOUGHS	POUNDS	296	124,650
HERBS	POUNDS	0	0
MUSHROOMS	POUNDS	6	190
BURLS	POUNDS	0	0
++SUBTOTAL-PROD MEASURED IN POUNDS++		303	125,340
HUCKLEBERRY BRUSH	BUNCHES	9	6501
FERNS	BUNCHES	17	5750
BEARGRASS	BUNCHES	1125	187,167
GREENS**	BUNCHES	2	30
++SUBTOTAL-PROD MEASURED IN BUNCHES++		1153	199,448
Total Number of Permits	XXXXXXXXXX	14,874	XXXXXXXXXXXX

* Wildings are considered to be those plants that are sold as transplants.

** Greens include many Special Forest Products species that are used in crafts and floral designs.

Since Pacific yew is currently being managed as a separate program, it is no longer considered a Special Forest Products.

Appendix T

Management for SEIS Special Attention Species

Table T-1. Species to be Protected Through Survey and Manage

Species	Survey Strategies ¹			
	1	2	3	4
Fungi				
Mycorrhizal Fungi				
Boletes				
<i>Gastroboletus subalpinus</i>	X		X	
<i>Gastroboletus turbinatus</i>			X	
Boletes, low elevation				
<i>Boletus piperatus</i>			X	
<i>Tylopilus pseudoscaber</i>	X		X	
Rare Boletes				
<i>Boletus haematinus</i>	X		X	
<i>Boletus pulcherrimus</i>	X		X	
<i>Gastroboletus imbellus</i>	X		X	
<i>Gastroboletus ruber</i>	X		X	
False Truffles				
<i>Nivatogastrium nubigenum</i>	X		X	
<i>Rhizopogon abietis</i>			X	
<i>Rhizopogon atroviolaceus</i>			X	
<i>Rhizopogon truncatus</i>			X	
<i>Thaxterogaster pingue</i>			X	
Uncommon False Truffle				
<i>Macowanites chlorinosmus</i>	X		X	
Rare False Truffles				
<i>Alpova alexsmithii</i>	X		X	
<i>Alpova olivaceotinctus</i>	X		X	
<i>Arcangeliella crassa</i>	X		X	
<i>Arcangeliella lactarioides</i>	X		X	
<i>Destuntzia fusca</i>	X		X	
<i>Destuntzia rubra</i>	X		X	
<i>Gautieria magnicellaris</i>	X		X	
<i>Gautieria otthii</i>	X		X	
<i>Leucogaster citrinus</i>	X		X	
<i>Leucogaster microsporus</i>	X		X	
<i>Macowanites lymanensis</i>	X		X	
<i>Macowanites mollis</i>	X		X	
<i>Martellia fragrans</i>	X		X	

Table T-1. Species to be Protected Through Survey and Manage (continued)

Species	Survey Strategies ¹			
	1	2	3	4
<i>Martellia idahoensis</i>	X		X	
<i>Martellia monticola</i>	X		X	
<i>Octavianina macrospora</i>	X		X	
<i>Octavianina papyracea</i>	X		X	
<i>Rhizopogon brunneiniger</i>	X		X	
<i>Rhizopogon evadens</i> var. <i>subalpinus</i>	X		X	
<i>Rhizopogon exiguus</i>	X		X	
<i>Rhizopogon flavofibrillosus</i>	X		X	
<i>Rhizopogon inquinatus</i>	X		X	
<i>Sedecula pulvinata</i>	X		X	
Undescribed Taxa, Rare Truffles and False Truffles				
<i>Alpova</i> sp. nov. #Trappe 9730	X		X	
<i>Alpova</i> sp. nov. #Trappe 1966	X		X	
<i>Arcangeliella</i> sp. nov. #Trappe 12382	X		X	
<i>Arcangeliella</i> sp. nov. #Trappe 12359	X		X	
<i>Chamonixia pacifica</i> sp. nov. #Trappe 12768	X		X	
<i>Elaphomyces</i> sp. nov. #Trappe 1038	X		X	
<i>Gastroboletus</i> sp. nov. #Trappe 2897	X		X	
<i>Gastroboletus</i> sp. nov. #Trappe 7515	X		X	
<i>Gastrosuillus</i> sp. nov. #Trappe 7516	X		X	
<i>Gastrosuillus</i> sp. nov. #Trappe 9608	X		X	
<i>Gymnomyces</i> sp. nov. #Trappe 4703,5576	X		X	
<i>Gymnomyces</i> sp. nov. #Trappe 5052	X		X	
<i>Gymnomyces</i> sp. nov. #Trappe 1690,1706,1710	X		X	
<i>Gymnomyces</i> sp. nov. #Trappe 7545	X		X	
<i>Hydnotrya</i> sp. nov. #Trappe 787,792	X		X	
<i>Hydnotrya subnix</i> sp. nov. #Trappe 1861	X		X	
<i>Martellia</i> sp. nov. #Trappe 649	X		X	
<i>Martellia</i> sp. nov. #Trappe 1700	X		X	
<i>Martellia</i> sp. nov. #Trappe 311	X		X	
<i>Martellia</i> sp. nov. #Trappe 5903	X		X	
<i>Octavianina</i> sp. nov. #Trappe 7502	X		X	
<i>Rhizopogon</i> sp. nov. #Trappe 9432	X		X	
<i>Rhizopogon</i> sp. nov. #Trappe 1692	X		X	
<i>Rhizopogon</i> sp. nov. #Trappe 1698	X		X	
<i>Thaxterogaster</i> sp. nov. #Trappe 4867,6242,7427,7962,8520	X		X	
<i>Tuber</i> sp. nov. #Trappe 2302	X		X	
<i>Tuber</i> sp. nov. #Trappe 12493	X		X	
Rare Truffles				
<i>Balsamia nigra</i>	X		X	
<i>Choiromyces alveolatus</i>	X		X	
<i>Choiromyces venosus</i>	X		X	
<i>Elaphomyces anthracinus</i>	X		X	
<i>Elaphomyces subviscidus</i>	X		X	

Table T-1. Species to be Protected Through Survey and Manage (continued)

Species	Survey Strategies ¹			
	1	2	3	4
Chanterelles				
<i>Cantharellus cibarius</i>			X	X
<i>Cantharellus subalbidus</i>			X	X
<i>Cantharellus tubaeformis</i>			X	X
Chanterelles - Gomphus				
<i>Gomphus bonarii</i>			X	
<i>Gomphus clavatus</i>			X	
<i>Gomphus floccosus</i>			X	
<i>Gomphus kauffmanii</i>			X	
Rare Chanterelle				
<i>Cantharellus formosus</i>	X		X	
<i>Polyozellus multiplex</i>	X		X	
Uncommon Coral Fungi				
<i>Ramaria abietina</i>			X	
<i>Ramaria araiospora</i>	X		X	
<i>Ramaria botrytis</i> var. <i>aurantiiramosa</i>	X		X	
<i>Ramaria concolor</i> f. <i>tsugina</i>			X	
<i>Ramaria coulterae</i>			X	
<i>Ramaria fasciculata</i> var. <i>sparsiramosa</i>	X		X	
<i>Ramaria gelatiniaurantia</i>	X		X	
<i>Ramaria largentii</i>	X		X	
<i>Ramaria rubella</i> var. <i>blanda</i>	X		X	
<i>Ramaria rubrievanescens</i>	X		X	
<i>Ramaria rubripermanens</i>	X		X	
<i>Ramaria suecica</i>			X	
<i>Ramaria thiersii</i>	X		X	
Rare Coral Fungi				
<i>Ramaria amyloidea</i>	X		X	
<i>Ramaria aurantiisiccescens</i>	X		X	
<i>Ramaria celerivirescens</i>	X		X	
<i>Ramaria claviramulata</i>	X		X	
<i>Ramaria concolor</i> f. <i>marri</i>	X		X	
<i>Ramaria cyaneigranosa</i>	X		X	
<i>Ramaria hiliaris</i> var. <i>olympiana</i>	X		X	
<i>Ramaria lorithamnus</i>	X		X	
<i>Ramaria maculatipes</i>	X		X	
<i>Ramaria rainierensis</i>	X		X	
<i>Ramaria rubribrunnescens</i>	X		X	
<i>Ramaria stuntzii</i>	X		X	
<i>Ramaria verlotensis</i>	X		X	
<i>Ramaria gracilis</i>	X		X	
<i>Ramaria spinulosa</i>	X		X	

Table T-1. Species to be Protected Through Survey and Manage (continued)

Species	Survey Strategies ¹			
	1	2	3	4
Phaeocollybia				
<i>Phaeocollybia attenuata</i>			X	
<i>Phaeocollybia californica</i>	X		X	
<i>Phaeocollybia carmanahensis</i>	X		X	
<i>Phaeocollybia dissiliens</i>	X		X	
<i>Phaeocollybia fallax</i>			X	
<i>Phaeocollybia gregaria</i>	X		X	
<i>Phaeocollybia kauffmanii</i>	X		X	
<i>Phaeocollybia olivacea</i>			X	
<i>Phaeocollybia oregonensis</i>	X		X	
<i>Phaeocollybia piceae</i>	X		X	
<i>Phaeocollybia pseudofestiva</i>			X	
<i>Phaeocollybia scatesiae</i>	X		X	
<i>Phaeocollybia sipei</i>	X		X	
<i>Phaeocollybia spadicea</i>			X	
Uncommon Gilled Mushrooms				
<i>Catathelasma ventricosa</i>			X	
<i>Cortinarius azureus</i>			X	
<i>Cortinarius boulderensis</i>	X		X	
<i>Cortinarius cyanites</i>			X	
<i>Cortinarius magnivelatus</i>	X		X	
<i>Cortinarius olympianus</i>	X		X	
<i>Cortinarius spilomius</i>			X	
<i>Cortinarius tabularis</i>			X	
<i>Cortinarius valgus</i>			X	
<i>Dermocybe humboldtensis</i>	X		X	
<i>Hebeloma olympiana</i>	X		X	
<i>Hygrophorus caeruleus</i> X	X		X	
<i>Hygrophorus karstenii</i>			X	
<i>Hygrophorus vernalis</i>	X		X	
<i>Russula mustelina</i>			X	
Rare Gilled Mushrooms				
<i>Chroogomphus oculatus</i>	X		X	
<i>Cortinarius canabarba</i>	X		X	
<i>Cortinarius rainierensis</i>	X		X	
<i>Cortinarius variipes</i>	X		X	
<i>Cortinarius verrucisporus</i>	X		X	
<i>Cortinarius wiebeae</i>	X		X	
<i>Tricholoma venenatum</i>	X		X	
Uncommon Ecto-Polypores				
<i>Albatrellus ellisii</i>			X	
<i>Albatrellus flettii</i>			X	
Rare Ecto-Polypores				
<i>Albatrellus avellaneus</i>	X		X	
<i>Albatrellus caeruleoporus</i>	X		X	

Table T-1. Species to be Protected Through Survey and Manage (continued)

Species	Survey Strategies ¹			
	1	2	3	4
Tooth Fungi				
<i>Hydnum repandum</i>			X	
<i>Hydnum umbilicatum</i>			X	
<i>Phellodon atratum</i>			X	
<i>Sarcodon fuscoindicum</i>			X	
<i>Sarcodon imbricatus</i>			X	
Rare Zygomycetes				
<i>Endogone arcogena</i>	X		X	
<i>Endogone oregonensis</i>	X		X	
<i>Glomus radiatum</i>	X		X	
Saprobies (Decomposers)				
Uncommon Gilled Mushrooms				
<i>Baeospora myriadophylla</i>			X	
<i>Chrysomphalina grossula</i>			X	
<i>Collybia bakerensis</i>	X		X	
<i>Fayodia gracilipes (rainierensis)</i>			X	
<i>Gymnopilus punctifolius</i>	X		X	
<i>Marasmius applanatipes</i>	X		X	
<i>Mycena hudsoniana</i>	X		X	
<i>Mycena lilacifolia</i>			X	
<i>Mycena marginella</i>			X	
<i>Mycena monticola</i>	X		X	
<i>Mycena overholtsii</i>	X		X	
<i>Mycena quinaultensis</i>	X		X	
<i>Mycena tenax</i>			X	
<i>Mythicomyces corneipes</i>			X	
<i>Neolentinus kauffmanii</i>	X		X	
<i>Pholiota albivelata</i>	X		X	
<i>Stagnicola perplexa</i>			X	
Rare Gilled Mushrooms				
<i>Clitocybe subditopoda</i>	X		X	
<i>Clitocybe senilis</i>	X		X	
<i>Neolentinus adherens</i>	X		X	
<i>Rhodocybe nitida</i>	X		X	
<i>Rhodocybe speciosa</i>	X		X	
<i>Tricholomopsis fulvescens</i>	X		X	
Noble Polypore (rare and endangered)				
<i>Oxyporus nobilissimus</i>	X	X	X	
Bondarzewia Polypore				
<i>Bondarzewia montana</i>	X	X	X	

Table T-1. Species to be Protected Through Survey and Manage (continued)

Species	Survey Strategies ¹			
	1	2	3	4
Rare Resupinates and Polypores				
<i>Aleurodiscus farlowii</i>	X		X	
<i>Dichostereum granulatum</i>	X		X	
<i>Cudonia monticola</i>			X	
<i>Gyromitra californica</i>			X	X
<i>Gyromitra esculenta</i>			X	X
<i>Gyromitra infula</i>			X	X
<i>Gyromitra melaleucoides</i>			X	X
<i>Gyromitra montana</i> (syn. <i>G. gigas</i>)			X	X
<i>Otidea leporina</i>			X	
<i>Otidea onotica</i>			X	
<i>Otidea smithii</i>	X		X	
<i>Plectania melastoma</i>			X	
<i>Podostroma alutaceum</i>			X	
<i>Sarcosoma mexicana</i>			X	
<i>Sarcosphaera eximia</i>			X	
<i>Spathularia flavida</i>			X	
Rare Cup Fungi				
<i>Aleuria rhenana</i>				
<i>Bryoglossum gracile</i>				
<i>Gelatinodiscus flavidus</i>	X		X	
<i>Helvella compressa</i>	X		X	
<i>Helvella crassitunicata</i>	X		X	
<i>Helvella elastica</i>	X		X	
<i>Helvella maculata</i>	X		X	
<i>Neourula pouchetii</i>	X		X	
<i>Pithya vulgaris</i>	X		X	
<i>Plectania latahensis</i>	X		X	
<i>Plectania milleri</i>	X		X	
<i>Pseudaleuria quinaultiana</i>	X		X	
Club Coral Fungi				
<i>Clavariadelphus ligula</i>			X	X
<i>Clavariadelphus pistillaris</i>			X	X
<i>Clavariadelphus truncatus</i>			X	X
<i>Clavariadelphus borealis</i>			X	X
<i>Clavariadelphus lovejoyae</i>			X	X
<i>Clavariadelphus sachalinensis</i>			X	X
<i>Clavariadelphus subfastigiatus</i>			X	X
Jelly Mushroom				
<i>Phlogoitis helvelloides</i>			X	X
Branched Coral Fungi				
<i>Clavulina cinerea</i>			X	X
<i>Clavulina cristata</i>			X	X
<i>Clavulina ornatipes</i>			X	X

Table T-1. Species to be Protected Through Survey and Manage (continued)

Species	Survey Strategies ¹			
	1	2	3	4
Mushroom Lichen <i>Phytoconis ericetorum</i>			X	X
Parasitic Fungi				
<i>Asterophora lycoperdoides</i>			X	
<i>Asterophora parasitica</i>			X	
<i>Collybia racemosa</i>			X	
<i>Cordyceps capitata</i>			X	
<i>Cordyceps ophioglossoides</i>			X	
<i>Hypomyces luteovirens</i>			X	
Cauliflower Mushroom <i>Sparassis crispa</i>			X	
Moss Dwelling Mushrooms				
<i>Cyphellostereum laeve</i>			X	
<i>Galerina atkinsoniana</i>			X	
<i>Galerina cerina</i>			X	
<i>Galerina heterocystis</i>			X	
<i>Galerina sphagnicola</i>			X	
<i>Galerina vittaeformis</i>			X	
<i>Rickenella setipes</i>			X	
Coral Fungi				
<i>Clavicornia avellanea</i>			X	
Lichens				
Rare Forage Lichen <i>Bryoria tortuosa</i>	X		X	
Rare Leafy (arboreal) Lichens				
<i>Hypogymnia duplicata</i>	X	X	X	
<i>Tholurna dissimilis</i>	X		X	
Rare Nitrogen-fixing Lichens				
<i>Dendriscoaulon intricatulum</i>	X		X	
<i>Lobaria hallii</i>	X		X	
<i>Lobaria linita</i>	X	X	X	
<i>Nephroma occultum</i>	X		X	
<i>Pannaria rubiginosa</i>	X		X	
<i>Pseudocyphellaria rainierensis</i>	X	X	X	
Nitrogen-fixing Lichens				
<i>Lobaria oregana</i>				X
<i>Lobaria pulmonaria</i>				X
<i>Lobaria scrobiculata</i>				X
<i>Nephroma bellum</i>				X
<i>Nephroma helveticum</i>				X

Table T-1. Species to be Protected Through Survey and Manage (continued)

Species	Survey Strategies ¹			
	1	2	3	4
<i>Nephroma laevigatum</i>				X
<i>Nephroma parile</i>				X
<i>Nephroma resupinatum</i>				X
<i>Pannaria leucostictoides</i>				X
<i>Pannaria mediterranea</i>				X
<i>Pannaria saubinetii</i>				X
<i>Peltigera collina</i>				X
<i>Peltigera neckeri</i>				X
<i>Peltigera pacifica</i>				X
<i>Pseudocyphellaria anomala</i>				X
<i>Pseudocyphellaria anthraspis</i>				X
<i>Pseudocyphellaria crocata</i>				X
<i>Stricta beauvoisii</i>				X
<i>Stricta fuliginosa</i>				X
<i>Stricta limbata</i>				X
Pin Lichens				
<i>Calicium abietinum</i>				X
<i>Clidium adaequatum</i>				X
<i>Calicium adpersum</i>				X
<i>Calicium glaucellum</i>				X
<i>Calicium viride</i>				X
<i>Chaenotheca brunneola</i>				X
<i>Chaenotheca chrysocephala</i>				X
<i>Chaenotheca ferruginea</i>				X
<i>Chaenotheca furfuracea</i>				X
<i>Chaenotheca subroscida</i>				X
<i>Chaenotheca pusilla</i>				X
<i>Cyphelium inquinans</i>				X
<i>Microcalicium arenarium</i>				X
<i>Mycocalicium subtile</i>				X
<i>Stenocybe clavata</i>				X
<i>Stenocybe major</i>				X
Rare Rock Lichens				
<i>Pilophorus nigricaulis</i>	X		X	
<i>Stricta arctica</i>	X		X	
Riparian Lichens				
<i>Cetrelia cetrarioides</i>				X
<i>Collema nigrescens</i>				X
<i>Leptogium burnetiae</i> var. <i>hirsutum</i>				X
<i>Leptogium cyanescens</i>				X
<i>Leptogium saturninum</i>				X
<i>Leptogium teretiusculum</i>				X
<i>Platismatia lacunosa</i>				X
<i>Ramalina thrausta</i>				X
<i>Usnea longissima</i>				X

Table T-1. Species to be Protected Through Survey and Manage (continued)

Species	Survey Strategies ¹			
	1	2	3	4
Aquatic Lichens				
<i>Dermatocarpon luridum</i>	X		X	
<i>Hydrothyria venosa</i>	X		X	
<i>Leptogium rivale</i>	X		X	
Rare Oceanic Influenced Lichens				
<i>Bryoria pseudocapillaris</i>	X		X	
<i>Bryoria spiralifera</i>	X		X	
<i>Bryoria subcana</i>	X		X	
<i>Buellia oidalea</i>	X		X	
<i>Erioderma solediatum</i>	X		X	
<i>Hypogymnia oceanica</i>	X		X	
<i>Leioderma solediatum</i>	X		X	
<i>Leptogium brebissonii</i>	X		X	
<i>Niebla cephalota</i>	X		X	
<i>Pseudocyphellaria mougeotiana</i>	X		X	
<i>Teloschistes flavicans</i>	X		X	
<i>Usnea hesperina</i>	X		X	
Oceanic Influenced Lichens				
<i>Cetraria californica</i>	X		X	
<i>Heterodermia leucomelos</i>	X		X	
<i>Loxospora sp. nov. "corallifera" (Brodo in dit)</i>	X		X	
<i>Pyrrhospora quernea</i>	X		X	
Additional Lichen Species				
<i>Cladonia norvegica</i>			X	
<i>Heterodermia sitchensis</i>			X	
<i>Hygomnia vittata</i>			X	
<i>Hypotrachyna revoluta</i>			X	
<i>Ramalina pollinaria</i>			X	
<i>Nephroma isidiosum</i>			X	
Bryophytes				
<i>Antitrichia curtispindula</i>				X
<i>Bartramiopsis lescurii</i>	X		X	
<i>Brotherella roelli</i>	X		X	
<i>Diplophyllu albicans</i>	X		X	
<i>Diplophyllum plicatum</i>	X	X		
<i>Douinia ovata</i>				X
<i>Encalypta brevicolla var. crumiana</i>	X		X	
<i>Herbertus aduncus</i>	X		X	
<i>Herbertus sakuraii</i>	X		X	
<i>Iwatsuklella leucotricha</i>	X		X	
<i>Kurzia makinoana</i>	X	X		
<i>Marsupella emarginata var. aquatica</i>	X	X		
<i>Orthodontium gracile</i>	X		X	
<i>Plagiochila satol</i>	X		X	
<i>Plagiochila semidecurrens</i>	X		X	

Table T-1. Species to be Protected Through Survey and Manage (continued)

Species	Survey Strategies ¹			
	1	2	3	4
<i>Pleuroziopsis ruthenica</i>	X		X	
<i>Ptilidium californicum</i>	X	X		
<i>Racomitrium aquaticum</i>	X		X	
<i>Radula brunnea</i>	X		X	
<i>Scouleria marginata</i>				X
<i>Tetraphis geniculata</i>	X		X	
<i>Tritomaria exsectiformis</i>	X	X		
<i>Tritomaria quinquedentata</i>	X		X	
Amphibians				
<i>Del Norte salamander</i>		X		
<i>Larch Mountain salamander</i>		X		
<i>Shasta salamander</i>	X	X		
<i>Siskiyou Mountains salamander</i>	X	X		
<i>Van Dyke's salamander (Cascades)</i>		X		
Mammals				
<i>Red tree vole (P. longicaudus)</i>		X		
Mollusks				
<i>Cryptomastix devia</i>	X	X		
<i>Cryptomastix hendersoni</i>	X	X		
<i>Monadenia fidelis minor</i>	X	X		
<i>Helminthoglypta hertleini</i>	X	X		
<i>Helminthoglypta talmadgei</i>	X	X		
<i>Megomphix hemphilli</i>	X	X		
<i>Monadenia chaceana</i>	X	X		
<i>Monadenia churchi</i>	X	X		
<i>Monadenia fidelis minor</i>	X	X		
<i>Monadenia troglodytes troglodytes</i>	X	X		
<i>Monadenia trglodytes wintu</i>	X	X		
<i>Oreohelix n. sp.</i>	X	X		
<i>Pristiloma articum crateris</i>	X	X		
<i>Trilobopsis roperi</i>	X	X		
<i>Trilobopsis tehamana</i>	X	X		
<i>Vertigo n. sp.</i>	X	X		
<i>Vespericola pressleyi</i>	X	X		
<i>Vespericola shasta</i>	X	X		
<i>Deroceras hesperium</i>	X	X		
<i>Hemphillia barringtoni</i>	X	X		
<i>Hemphillia glandulosa</i>	X	X		
<i>Hemphillia malonei</i>	X	X		
<i>Hemphillia pantherina</i>	X	X		
<i>Prophysaon coeruleum</i>	X	X		
<i>Prophysaon dubium</i>	X	X		
<i>Fluminicola n. sp. 1</i>	X	X		
<i>Fluminicola n. sp. 11</i>	X	X		
<i>Fluminicola n. sp. 14</i>	X	X		
<i>Fluminicola n. sp. 15</i>	X	X		

Table T-1. Species to be Protected Through Survey and Manage (continued)

Species	Survey Strategies ¹			
	1	2	3	4
<i>Fluminicola n. sp. 16</i>	X	X		
<i>Fluminicola n. sp. 17</i>	X	X		
<i>Fluminicola n. sp. 18</i>	X	X		
<i>Fluminicola n. sp. 19</i>	X	X		
<i>Fluminicola n. sp. 2</i>	X	X		
<i>Fluminicola n. sp. 20</i>	X	X		
<i>Fluminicola n. sp. 3</i>	X	X		
<i>Fluminicola seminalis</i>	X	X		
<i>Juga (O.) n. sp. 2</i>	X	X		
<i>Juga (O.) n. sp.3</i>	X	X		
<i>Lyogyrus n. sp. 1</i>	X	X		
<i>Lyogyrus n. sp. 2</i>	X	X		
<i>Lyogyrus n. sp. 3</i>	X	X		
<i>Vorticifex klamathensis sinitsini</i>	X	X		
<i>Vorticifex n. sp. 1</i>	X	X		
Vascular Plants				
<i>Alotropa virgata</i>	X	X		
<i>Arceuthobium tsugense</i>	X	X		
<i>Aster vialis</i>	X	X		
<i>Bensoniella oregana (California)</i>	X	X		
<i>Botrychium minganense</i>	X	X		
<i>Botrychium montanum</i>	X	X		
<i>Clintonia andrewsiana</i>	X	X		
<i>Coptis asplenifolia</i>	X	X		
<i>Coptis trifolia</i>	X	X		
<i>Corydalis aquae-gelidae</i>	X	X		
<i>Cypripedium fasciculatum</i>	X	X		
<i>Cypripedium montanum (west Cascades)</i>	X	X		
<i>Galium kamtschaticum</i>	X	X		
<i>Habenaria orbiculata</i>	X	X		
<i>Pedicularis howellii</i>	X	X		
<i>Scoliopus biglovei</i>	X	X		
Anthropods				
<i>Canopy herbivores (south range)</i>				X
<i>Coarse wood chewers (south range)</i>				X
<i>Litter and soil dwelling species (south range)</i>				X
<i>Understory and forest gap herbivores</i>				X
Birds				

¹Survey Strategies: 1 = manage known sites; 2 = survey prior to activities and manage sites; 3 = conduct extensive surveys and manage sites; 4 = conduct general regional surveys.

²Protection Buffers are additional standards and guidelines from the Scientific Analysis Team Report for specific rare and locally endemic species, and other specific species in the upland forest matrix (see record of decision for SEIS (page C-19).

Table T-2. Species to be Protected Through Protection Buffers

Species	Land Use Allocation Established for the Protection Buffer
Nonvascular plants	
<i>Ptilidium californicum</i> (Liverwort)	Late-Successional Reserve
<i>Ulota meglospora</i> (moss)	Late-Successional Reserve
<i>Buxbaumia piperi</i> (moss)	Managed Late -Successional Area
<i>Buxbaumia viridis</i> (moss)	Managed Late -Successional Area
<i>Rhizomnium nudum</i> (moss)	Managed Late -Successional Area
<i>Tetraphis geniculator</i> (moss)	Managed Late -Successional Area
<i>Aleuria rhemana</i> (fungus)	Late-Successional Reserve
<i>Polyozellus multiplex</i> (fungus)	Managed Late -Successional Area
<i>Sarcosoma mexicana</i> (fungus)	Managed Late -Successional Area
<i>Otidea leporina</i> (fungus)	Late-Successional Reserve
<i>Otidea onotica</i> (fungus)	Late-Successional Reserve
<i>Otidea smithii</i> (fungus)	Late-Successional Reserve
Amphibians	
<i>Shasta salamander</i>	Late-Successional Reserve
<i>Larch Mountain salamander</i>	Managed Late -Successional Area
<i>Siskyou Mountain salamander</i>	Managed Late -Successional Area
<i>Del Norte salamander</i>	Managed Late -Successional Area
Birds	
<i>Great Grey Owl</i>	Late-Successional Reserve
<i>White-headed woodpecker</i>	No Special Land Use Allocation
<i>Black-backed woodpecker</i>	No Special Land Use Allocation
<i>Pygmy nuthatch</i>	No Special Land Use Allocation
<i>Flammulated Owl</i>	No Special Land Use Allocation

Appendix U

Resource Management Plan Monitoring

All Land Use Allocations

Expected Future Conditions and Outputs

Protection of SEIS special attention species so as not to elevate their status to any higher level of concern.

Implementation Monitoring

Questions

1. Are surveys for the species listed in Appendix T conducted before ground disturbing activities occur?
2. Are protection buffers being provided for specific rare and locally endemic species and other species in the upland forest matrix?
3. Are the sites of amphibians, mammals, bryophytes, mollusks, vascular plants, fungi, lichens, and arthropod species listed in Appendix T being protected?
4. Are the sites of amphibians, mammals, bryophytes, mollusks, vascular plants, fungi, lichens and arthropod species listed in Appendix T being surveyed?
5. Are high priority sites for species management being identified?
6. Are general regional surveys being conducted to acquire additional information and to determine necessary levels of protection for arthropods, fungi species that were not classed as rare and endemic, bryophytes, and lichens?

Monitoring Requirements

1. At least 20 percent of all management actions will be examined prior to project initiation and re-examined following project completion, to determine if: surveys are conducted for species listed in Appendix T, protection buffers are

provided for specific rare and locally endemic species and other species in the upland forest matrix, and sites of species listed in Appendix T are protected.

2. The Annual Program Summary will address Implementation Questions 4-6.

Effectiveness and Validation Monitoring

Questions

1. Are measures taken to protect the SEIS special attention species effective?
2. Is the forest ecosystem functioning as a productive and sustainable ecological unit?

Monitoring Requirements

Deferred to SEIS Monitoring Plan.

Riparian Reserves

Expected Future Conditions and Outputs

See Aquatic Conservation Strategy Objectives.

Provision of habitat for special status and SEIS special attention species.

Implementation Monitoring

Questions

1. Are watershed analyses being completed before on-the-ground actions are initiated in Riparian Reserves?
2. Is the width and integrity of the Riparian Reserves being maintained?

(e.g., did the conditions that existed before management activities change in ways that are not in accordance with the SEIS Record of Decision Standards and Guidelines and RMP management direction?)

3. What silvicultural practices are being applied to control stocking, reestablish and manage stands, and acquire desired vegetation characteristics needed to attain Aquatic Conservation Strategy Objectives?
4. Are management activities in Riparian Reserves consistent with SEIS Record of Decision Standards and Guidelines, RMP management direction, and Aquatic Conservation Strategy Objectives?
5. Are new structures and improvements in Riparian Reserves constructed to minimize the diversion of natural hydrologic flow paths, reduce the amount of sediment delivery into the stream, protect fish and wildlife populations, and accommodate the 100-year flood?
6. A) Are all mining structures, support facilities, and roads located outside the Riparian Reserves? B) Are those located within the Riparian Reserves meeting the objectives of the Aquatic Conservation Strategy? C) Are all solid and sanitary waste facilities excluded from Riparian Reserves or located, monitored, and reclaimed in accordance with SEIS Record of Decision Standards and Guidelines and RMP management direction?
7. Are new recreation facilities within the Riparian Reserves designed to meet, and where practicable, contribute to Aquatic Conservation Strategy Objectives? Are mitigation measures initiated where existing recreation facilities are not meeting Aquatic Conservation Strategy Objectives?

Monitoring Requirements

1. The files on each year's on-the-ground actions will be checked annually to ensure that watershed analyses were completed prior to project initiation and to ensure the concerns identified in the watershed analysis were addressed in the project's Environmental Assessment.
2. At least 20 percent of management activities within each resource area will be examined prior

to project initiation and re-examined following project completion, to determine whether the width and integrity of the Riparian Reserves were maintained.

3. The Annual Program Summary will report what silvicultural practices are being applied in order to attain Aquatic Conservation Strategy Objectives.
4. At least 20 percent of the activities that are conducted or authorized within Riparian Reserves will be reviewed in order to identify whether the actions were consistent with the SEIS Record of Decision Standards and Guidelines, RMP management direction, and Aquatic Conservation Strategy Objectives. In addition to reporting the results of this monitoring, the Annual Program Summary will also summarize the types of activities that were conducted or authorized within Riparian Reserves.
5. All new structures and improvements within a Riparian Reserve will be monitored during and after construction to ensure that it was constructed to: minimize the diversion of natural hydrologic flow paths, reduce the amount of sediment delivery into the stream, protect fish and wildlife populations, and accommodate the 100 year flood.
6. All approved mining Plans of Operations will be reviewed to determine if: A) both a reclamation plan and bond were required B) structures, support facilities and roads were located outside of Riparian Reserves, or in compliance with Aquatic Conservation Strategy objectives if located inside the Riparian Reserve C) and if solid and sanitary waste facilities were excluded from Riparian Reserves or located, monitored, and reclaimed in accordance with RMP management direction.
7. The Annual Program Summary will examine the status of evaluations of existing recreational facilities inside Riparian Reserves, to ensure that Aquatic Conservation Strategy Objectives are met. The Summary will also report on the status of the mitigation measures initiated where the Aquatic Conservation Strategy objectives cannot be met.

Effectiveness and Validation Monitoring

Questions

1. Is the health of Riparian Reserves improving?
2. Are management actions designed to rehabilitate Riparian Reserves effective?

Monitoring Requirements

Deferred to SEIS Monitoring Plan.

Late-Successional Reserves

Expected Future Conditions and Outputs

Development and maintenance of a functional, interacting, late-successional, and old-growth forest ecosystem in Late-Successional Reserves.

Protection and enhancement of habitat for late-successional and old-growth forest-related species including the northern spotted owl and marbled murrelet.

Implementation Monitoring

Questions

1. What is the status of the preparation of assessment and fire plans for Late-Successional Reserves?
2. What activities were conducted or authorized within Late-Successional Reserves and how were they compatible with the objectives of the Late-Successional Reserve plan? Were the activities consistent with SEIS Record of Decision Standards and Guidelines, RMP management direction and Regional Ecosystem Office review requirements, and the Late-Successional Reserve assessment?
3. What is the status of development and implementation of plans to eliminate or control non-native species which adversely impact late-successional objectives?

Monitoring Requirements

1. The Annual Program Summary will address Implementation Questions 1-3.

Effectiveness and Validation Monitoring

Questions

1. Are forest management activities (e.g., special forest product harvest activities) within Late-Successional Reserves compatible with the goal of developing and maintaining a functional, interacting, late-successional and old-growth forest ecosystem?
2. Does the harvest of special forest products have adverse effects on Late-Successional Reserve objectives?
3. Is a functional, interacting, late-successional ecosystem maintained where adequate and restored where inadequate?
4. Did silvicultural treatments benefit the creation and maintenance of late-successional conditions?
5. What is the relationship between levels of management intervention and the health and maintenance of late-successional and old-growth ecosystems?

Monitoring Requirements

Deferred to SEIS Monitoring Plan

Adaptive Management Areas

Expected Future Conditions and Outputs

Utilization of Adaptive Management Areas for the development and application of new management approaches for the integration and achievement of ecological health, and economic and other social objectives.

Provision of well-distributed, late-successional habitat outside reserves; retention of key structural elements

of late-successional forests on lands subjected to regeneration harvest; restoration and protection of riparian zones; and provision of a stable timber supply.

Implementation Monitoring

Questions

1. Are the Adaptive Management Area plans being developed, and do they establish future desired conditions?

Monitoring Requirements

1. The Annual Program Summary will address Implementation Question 1.

Effectiveness and Validation Monitoring

Deferred to SEIS Monitoring Plan and individual Adaptive Management Area management plans.

Matrix

Expected Future Conditions and Outputs

Production of a stable supply of timber and other forest commodities.

Maintenance of important ecological functions such as dispersal of organisms, carryover of some species from one stand to the next, and maintenance of ecologically valuable structural components such as down logs, snags, and large trees.

Assurance that forests in the Matrix provide for connectivity between Late-Successional Reserves.

Provision of habitat for a variety of organisms associated with early and late-successional forests.

Implementation Monitoring

Questions

1. Are suitable numbers of snags, coarse woody debris, and green trees being left, following

timber harvest, as called for in the SEIS Record of Decision Standards and Guidelines and RMP management direction?

2. Are timber sales being designed to meet ecosystem goals for the Matrix?
3. Are late-successional stands being retained in fifth-field watersheds in which federal forest lands have 15 percent or less late-successional forest?

Monitoring Requirements

1. At least 20 percent of regeneration harvest timber sales in each resource area will be examined by pre- and post-harvest (and after site preparation) inventories to determine snag and green tree numbers, heights, diameters, and distribution within harvest units. The measure of distribution of snags and green trees will be the percent in the upper, middle, and lower thirds of the sale units monitored. Snags and green trees left following timber harvest activities (including site preparation for reforestation) will be compared to those that were marked prior to harvest.

The same timber sales will also be inventoried pre- and post-harvest to determine if SEIS Record of Decision and RMP down log retention direction has been followed.

2. At least 20 percent of the files on each year's timber sales will be reviewed annually to determine if ecosystem goals were addressed in the silvicultural prescriptions.
3. All proposed regeneration harvest timber sales in watersheds with less than 15 percent late-successional forest remaining will be reviewed prior to sale to ensure that a watershed analysis has been completed.

Effectiveness and Validation Monitoring

Questions

1. Are stands growing at a rate that will produce the predicted yields?
2. Are forests in the Matrix providing for connectivity between Late-Successional Reserves?

Monitoring Requirements

Deferred to the SEIS Monitoring Plan.

Air Quality

Expected Future Conditions and Outputs

Attainment of National Ambient Air Quality Standards, Prevention of Significant Deterioration goals, and Oregon Visibility Protection Plan and Smoke Management Plan goals.

Maintenance and enhancement of air quality and visibility in a manner consistent with the Clean Air Act and the State Implementation Plan.

Implementation Monitoring

Questions

1. Were efforts made to minimize the amount of particulate emissions from prescribed burns?
2. Are dust abatement measures used during construction activities and on roads during BLM timber harvest operations and other BLM commodity hauling activities?
3. Are conformity determinations being prepared prior to activities which may contribute to a new violation of the National Ambient Air Quality Standards, increase the frequency or severity of an existing violation, or delay the timely attainment of a standard?

Monitoring Requirements

1. At least twenty percent of prescribed burn projects will be randomly selected for monitoring to assess what efforts were made to minimize particulate emissions, and whether the environmental analysis that preceded the decision to burn addressed the questions set forth in the SEIS discussion of Emission Monitoring (Chap. 3&4 p. 100).
2. At least twenty percent of the construction activities and commodity hauling activities will be monitored to determine if dust abatement measures were implemented.

3. The Annual Program Summary will address Implementation Question 3.

Effectiveness and Validation Monitoring

Questions

1. What techniques were the most effective in minimizing the amount of particulate emissions from prescribed burns?
2. Are BLM prescribed burns contributing to intrusions into Class I areas or nonattainment areas?
3. Of the intrusions that the BLM is reported to be responsible for, what was the cause and what can be done to minimize future occurrences?
4. Are BLM prescribed underburns causing adverse air quality impacts to rural communities?
5. Are prescribed fires decreasing the actual or potential impacts from wildfire emissions?

Monitoring Requirements

Deferred to SEIS Monitoring Plan.

Water and Soils

Expected Future Conditions and Outputs

Restoration and maintenance of the ecological health of watersheds. See Aquatic Conservation Strategy Objectives.

Improvement and/or maintenance of water quality in municipal water systems.

Improvement and/or maintenance of soil productivity.

Reduction of existing road mileage within Key Watersheds or at a minimum no net increase.

Implementation Monitoring

Questions

1. Are site specific Best Management Practices, identified as applicable during interdisciplinary review, carried forward into project design and execution?
2. What watershed analyses have been or are being performed? Are watershed analyses being performed prior to management activities in Key Watersheds?
3. What is the status of identification of instream flow needs for the maintenance of channel conditions, aquatic habitat, and riparian resources?
4. What watershed restoration projects are being developed and implemented?
5. What fuel treatment and fire suppression strategies have been developed to meet Aquatic Conservation Strategy Objectives?
6. What is the status of development of road or transportation management plans to meet Aquatic Conservation Strategy Objectives?
7. What is the status of preparation of criteria and standards which govern the operation, maintenance, and design for the construction and reconstruction of roads?
8. What is the status of the reconstruction of roads and associated drainage features identified in watershed analysis as posing a substantial risk? What is the status of closure or elimination of roads to further Aquatic Conservation Strategy Objectives; and to reduce the overall road mileage within Key Watersheds? If funding is insufficient to implement road mileage reductions, are construction and authorizations through discretionary permits denied to prevent a net increase in road mileage in Key Watersheds?
9. What is the status of reviews of ongoing research in Key Watersheds to insure that significant risk to the watershed does not exist?
10. What is the status of evaluation of recreation, interpretive, and user-enhancement activities/facilities to determine their effects on the watershed? What is the status of eliminating or relocating these activities/facilities when found to

be in conflict with Aquatic Conservation Strategy Objectives?

11. What is the status of cooperation with other agencies in the development of watershed-based Research Management Plans and other cooperative agreements to meet Aquatic Conservation Strategy Objectives? What is the status of cooperation with other agencies to identify and eliminate wild ungulate impacts which are inconsistent with attainment of Aquatic Conservation Strategy objectives?

Monitoring Requirements

1. At least 20 percent of the timber sales and silviculture projects stratified by management category will be randomly selected for monitoring to determine whether or not Best Management Practices were implemented as prescribed. The selection of management actions to be monitored will be based on which Best Management Practices are being prescribed and on which beneficial uses are likely to be impacted.
2. Compliance checks will be completed for all agreements entered into with providers of municipal water.
3. The Annual Program Summary will address Implementation Questions 3-14.

Effectiveness and Validation Monitoring

Questions

1. Is the ecosystem function of the watersheds improving?
2. Are State water quality criteria being met? When State water quality criteria is met, are the beneficial uses of riparian areas protected?
3. Are prescribed Best Management Practices maintaining or restoring water quality consistent with basin specific State water quality criteria for protection of specified beneficial uses?

Monitoring Requirements

Deferred to SEIS Monitoring Plan

Wildlife Habitat

Expected Future Conditions and Outputs

Maintenance of biological diversity and ecosystem health to contribute to healthy wildlife populations.

Implementation Monitoring

Questions

1. Are suitable (diameter and length) numbers of snags, coarse woody debris, and green trees being left, in a manner that meets the needs of species and provides for ecological functions in harvested areas as called for in the SEIS Record of Decision Standards and Guidelines and RMP management direction?
2. Are special habitats being identified and protected?
3. What is the status of designing and implementing wildlife restoration projects?
4. What is the status of designing and constructing wildlife interpretive and other user-enhancement facilities?

Monitoring Requirements

1. At least 20 percent of regeneration harvest timber sales in each resource area will be examined by pre- and post-harvest (and after site preparation) inventories to determine snag and green tree numbers, heights, diameters, and distribution within harvest units. The measure of distribution of snags and green trees will be the percent in the upper, middle, and lower thirds of the sale units monitored. Snags and green trees left following timber harvest activities (including site preparation for reforestation) will be compared to those that were marked prior to harvest.

The same timber sales will also be inventoried pre- and post-harvest to determine if SEIS Record of Decision and RMP down log retention direction has been followed.

2. At least 20 percent of BLM actions, within each resource area, on lands including or near special

habitats will be examined to determine whether special habitats were protected.

3. The Annual Program Summary will address Implementation Questions 4 and 5.

Effectiveness and Validation Monitoring

Questions

1. Are habitat conditions for late-successional forest associated species maintained where adequate, and restored where inadequate?
2. Are the snags, green trees, and coarse woody debris being left, achieving the habitat necessary to attain the desired population at a relevant landscape level?
3. Are BLM actions intended to protect special habitats actually protecting the habitat? Is the protection of special habitats helping to protect the species population?
4. What are the effects of management on species richness (numbers and diversity)?

Monitoring Requirements

Deferred to SEIS Monitoring Plan

(Which will address a variety of wildlife species such as amphibians, mollusks, neotropical migratory birds, etc.)

Fish Habitat

Expected Future Conditions and Outputs

See Aquatic Conservation Strategy Objectives.

Maintenance or enhancement of the fisheries potential of streams and other waters, consistent with BLM's Anadromous Fish Habitat Management on Public Lands guidance, BLM's Fish and Wildlife 2000 Plan, the Bring Back the Natives initiative, and other nationwide initiatives.

Rehabilitation and protection of at-risk fish stocks and their habitat.

Implementation Monitoring

Questions

1. Are at-risk fish species and stocks being identified?
2. Are fish habitat restoration and enhancement activities being designed and implemented which contribute to attainment of Aquatic Conservation Strategy Objectives?
3. Are potential adverse impacts to fish habitat and fish stocks being identified?

Monitoring Requirements

1. The Annual Program Summary will report on the status of watershed analysis to identify at-risk fish species and stocks, their habitat within individual watersheds, and restoration project needs.
2. The Annual Program Summary will report on the status of the design and implementation of fish habitat restoration and habitat activities.
3. The Annual Program Summary will report on the status of cooperation with federal, tribal, and state fish management agencies to identify and eliminate impacts associated with poaching, harvest, habitat manipulation, and fish stocking which threaten the continued existence and distribution of native fish stocks inhabiting federal lands. The Summary will also identify any management activities or fish interpretive and other user-enhancement facilities which have detrimental effects on native fish stocks.
4. At least 20 percent of the files on each year's timber sales, and other relevant actions, will be reviewed annually to evaluate documentation regarding fish species and habitat and related recommendations and decisions in light of policy and SEIS Record of Decision Standards and Guidelines and RMP management direction. If mitigation was required, review will ascertain whether such mitigation was incorporated in the authorization document and the actions will be reviewed on the ground after completion to ascertain whether the mitigation was carried out as planned.

Effectiveness and Validation Monitoring

Questions

1. Is the ecological health of the aquatic ecosystems recovering or sufficiently maintained to support stable and well-distributed populations of fish species and stocks?
2. Is fish habitat in terms of quantity and quality of rearing pools, coarse woody debris, water temperature, and width to depth ratio being maintained or improved as predicted?
3. Are desired habitat conditions for listed, sensitive, and at-risk fish stocks maintained where adequate, and restored where inadequate?

Monitoring Requirements

Deferred to SEIS Monitoring Plan

Special Status and SEIS Special Attention Species Habitat

Expected Future Conditions and Outputs

Protection, management, and conservation of federal listed and proposed species and their habitats, to achieve their recovery in compliance with the Endangered Species Act and Bureau special status species policies.

Conservation of federal candidate and Bureau sensitive species and their habitats so as not to contribute to the need to list and recover the species.

Conservation of state listed species and their habitats to assist the state in achieving management objectives.

Maintenance or restoration of community structure, species composition, and ecological processes of special status plant and animal habitat.

Protection of Bureau assessment species and SEIS special attention species so as not to elevate their status to any higher level of concern.

Implementation Monitoring

Questions

1. Are special status species being addressed in deciding whether or not to go forward with forest management and other actions? During forest management and other actions that may disturb special status species, are steps taken to adequately mitigate disturbances?
2. Are the actions identified in plans to recover species being implemented in a timely manner?
3. What coordination with other agencies has occurred in the management of special status species?
4. What land acquisitions occurred or are under way, to facilitate the management and recovery of special status species?
5. What site specific plans for the recovery of special status species were or are being developed?
6. What is the status of analysis which ascertains species requirements or enhances the recovery or survival of a species?
7. What is the status of efforts to maintain or restore the community structure, species composition, and ecological processes of special status plant and animal habitat?

Monitoring Requirements

1. At least 20 percent of the files on each year's timber sales and other relevant actions (e.g., rights-of-way, instream structures) will be reviewed annually to evaluate documentation regarding special status species and related recommendations and decisions in light of Endangered Species Act requirements, policy and SEIS Record of Decision Standards and Guidelines, and RMP management direction. If mitigation was required, review will ascertain whether such mitigation was incorporated in the authorization document and the actions will be reviewed on the ground after completion to

ascertain whether the mitigation was carried out as planned.

2. Review implementation schedule and actions taken annually, to ascertain if the actions to recover species were carried out as planned.
3. The Annual Program Summary will address Implementation Questions 3-7.

Effectiveness and Validation Monitoring

Questions

1. Are trends for special status species meeting the objectives of mitigation and/or conservation actions?
2. Have any Federal Candidates, Bureau Assessment, or Bureau Sensitive species been elevated to higher levels of concern due to BLM management?
3. Were desired habitat conditions for the northern spotted owl and marbled murrelet maintained where adequate and restored where inadequate?

Monitoring Requirements

Deferred to SEIS Monitoring Plan
(Which will address a variety of special status species including marbled murrelet, bald eagle, northern spotted owl, anadromous fish species, etc.)

Special Areas

Expected Future Conditions and Outputs

Maintenance, protection, and/or restoration of the relevant and important values of the special areas which include: Areas of Critical Environmental Concern, Outstanding Natural Areas, Research Natural Areas, and Environmental Education Areas.

Provision of recreation uses and environmental education in Outstanding Natural Areas.
Management of uses to prevent damage to those values that make the area outstanding.

Preservation, protection, or restoration of native species composition and ecological processes of biological communities in Research Natural Areas.

Provision and maintenance of environmental education opportunities in Environmental Education Areas. Management of uses to minimize disturbances of educational values.

Retention of existing Research Natural Areas and existing Areas of Critical Environmental Concern that meet the test for continued designation. Retention of other special areas. Provision of new special areas where needed to maintain or protect important values.

Implementation Monitoring

Questions

1. Are BLM actions and BLM authorized actions/uses near or within special areas consistent with RMP objectives and management direction for special areas?
2. What is the status of the preparation, revision, and implementation of Areas of Critical Environmental Concern management plans?
3. Are interpretive programs and recreation uses being developed and encouraged in Outstanding Natural Areas? Are the outstanding values of the Outstanding Natural Areas being protected from damage?
4. What environmental education and research initiatives and programs are occurring in the Research Natural Areas and Environmental Education Areas?
5. Are existing BLM actions and BLM authorized actions and uses not consistent with management direction for special areas being eliminated or relocated?
6. Are actions being identified which are needed to maintain or restore the important values of the special areas? Are the actions being implemented?
7. Are protection buffers being provided for specific rare and locally endemic species and other species in the upland forest matrix?

Monitoring Requirements

1. Annually, the files on all actions and research proposals within and adjacent to special areas will be reviewed to determine whether the possibility of impacts on Area of Critical Environmental Concern values was considered, and whether any mitigation identified as important for maintenance of Area of Critical Environmental Concern values was required. If mitigation was required, the relevant actions will be reviewed on the ground, after completion, to ascertain whether it was actually implemented.
2. The Annual Program Summary will address Implementation Questions 2-7.

Effectiveness and Validation Monitoring

Questions

1. Are the implemented management actions, designed to protect the values of the special areas, effective?
2. Are the special areas managed to restore or prevent the loss of outstanding values and minimize disturbance?

Monitoring Requirements

1. Each special area will be monitored at least every three years to determine if the values for which it was designated are being maintained.
2. Each Area of Critical Environmental Concern will be monitored annually to determine if proactive management actions met their objectives.

Cultural Resources Including American Indian Values

Expected Future Conditions and Outputs

Identification of cultural resource localities for public, scientific, and cultural heritage purposes.

Conservation and protection of cultural resource values for future generations.

Provision of information on long-term environmental change and past interactions between humans and the environment.

Fulfillment of responsibilities to appropriate American Indian groups regarding heritage and religious concerns.

Implementation Monitoring

Questions

1. Are cultural resources being addressed in deciding whether or not to go forward with forest management and other actions? During forest management and other actions that may disturb cultural resources, are steps taken to adequately mitigate disturbances?
2. What mechanisms have been developed to describe past landscapes and the role of humans in shaping those landscapes?
3. What efforts are being made to work with American Indian groups to accomplish cultural resource objectives and achieve goals outlined in existing memoranda of understanding and develop additional memoranda as needs arise?
4. What public education and interpretive programs were developed to promote the appreciation of cultural resources?

Monitoring Requirements

1. At least 20 percent of the files on each year's timber sales and other relevant actions (e.g., rights-of-way, instream structures) will be reviewed annually to evaluate documentation regarding cultural resources and American Indian values and decisions in light of requirements, policy and SEIS Record of Decision Standards and Guidelines and RMP management direction. If mitigation was required, review will ascertain whether such mitigation was incorporated in the authorization document and the actions will be reviewed on the ground after completion to ascertain whether the mitigation was carried out as planned.
2. The Annual Program Summary will address Implementation Questions 2-4.

Effectiveness and Validation Monitoring

Questions

1. Are sites of religious and cultural heritage adequately protected?
2. Do American Indians have access to and use of forest species, resources and places important for cultural, subsistence, or economic reasons; particularly those identified in treaties?

Monitoring Requirements

1. All cultural resource sites, where management and/or mitigation measures are utilized to protect the resource, will be monitored at least once a year to determine if the measures were effective.

The balance is deferred to SEIS Monitoring Plan.

Visual Resources

Expected Future Conditions and Outputs

Preservation or retention of the existing character of landscapes on BLM-administered lands allocated for Visual Resource Management Class I and II management; partial retention of the existing character on lands allocated for Visual Resource Management Class III management and major modification of the existing character of some lands allocated for Visual Resource Management Class IV management.

Continuation of emphasis on management of scenic resources in selected high-use areas to retain or preserve scenic quality.

Implementation Monitoring

Questions

1. Are visual resource design features and mitigation methods being followed during timber sales and other substantial actions in Class II and III areas?

Monitoring Requirements

1. Twenty percent of the files for timber sales and other substantial projects in Visual Resource Management Class II or III areas will be reviewed to ascertain whether relevant design features or mitigating measures were included.

Effectiveness and Validation Monitoring

Questions

1. Are timber sales and other major actions in Class II and Class III areas meeting or exceeding Visual Resource Management objectives?
2. Are Visual Resource Management objectives being met consistently, over long periods of time, in Class II management areas?

Monitoring Requirements

1. All timber sales and other selected projects in Visual Resource Management Class II areas and at least 20 percent of sales or projects in Class III areas that have special design features, or mitigating measures for visual resource protection, will be monitored to evaluate the effectiveness of the practices used to conserve visual resources.
2. In Visual Resource Management Class II management areas, where two or more sales or actions have occurred, impacts will be monitored at a minimum interval of five years.

Wild and Scenic Rivers

Expected Future Conditions and Outputs

Protection of the Outstandingly Remarkable Values of designated components of the National Wild and Scenic Rivers System through the maintenance and enhancement of the natural integrity of river-related values.

Protection of the Outstandingly Remarkable Values of eligible/suitable Wild and Scenic Rivers and the maintenance or enhancement of the highest tentative

classification pending resolution of suitability and/or designation.

Protection of the natural integrity of river-related values for the maintenance or enhancement of the highest tentative classification determination for rivers found eligible or studied for suitability.

Designation of important and manageable river segments suitable for designation where such designation contributes to the National Wild and Scenic Rivers System.

Implementation Monitoring

Questions

1. Are BLM actions and BLM authorized actions consistent with protection of the Outstandingly Remarkable Values of designated, suitable, and eligible, but not studied, rivers?
2. Are existing plans being revised to conform to Aquatic Conservation Strategy Objectives? Are revised plans being implemented?

Monitoring Requirements

1. Annually, the files on all actions and research proposals within and adjacent to Wild and Scenic River corridors will be reviewed to determine whether the possibility of impacts on the Outstandingly Remarkable Values was considered, and whether any mitigation identified as important for maintenance of the values was required. If mitigation was required, the relevant actions will be reviewed on the ground, after completion, to ascertain whether it was actually implemented.
2. The Annual Program Summary report will summarize progress on preparation and revision of Wild and Scenic River management plans, their conformance with the Aquatic Conservation Strategy Objectives, and the degree to which these plans have been implemented.

Effectiveness and Validation Monitoring

Questions

1. Are the Outstandingly Remarkable Values for which the Wild and Scenic Rivers were designated being maintained?
2. Are the Outstandingly Remarkable Values of the rivers which were found suitable or eligible, but not studied, protected?

Monitoring Requirements

1. Each Wild and Scenic River will be monitored at least once a year to determine if the Outstandingly Remarkable Values are being maintained.
2. Each river which was found suitable or eligible, but not studied, will be monitored at least once a year to determine if the Outstandingly Remarkable Values are being maintained.

Rural Interface Areas

Expected Future Conditions and Outputs

Consideration of the interests of adjacent and nearby rural land owners, including residents, during analysis, planning, and monitoring related to managed rural interface areas. (These interests include personal health and safety, improvements to property and quality of life.)

Determination of how land owners might be or are affected by activities on BLM-administered land.

Implementation Monitoring

Questions

1. Are design features and mitigation measures developed and implemented to avoid/minimize impacts to health, life and property and quality of life and to minimize the possibility of conflicts between private and federal land management?

Monitoring Requirements

1. At least 20 percent of all actions within the identified rural interface areas will be examined to determine if special project design features and mitigation measures were included and implemented as planned.

Effectiveness and Validation Monitoring

Questions

1. Are the rural interface area design features and mitigation measures effective in minimizing impacts to health, life, and property?

Monitoring Requirements

1. At least 20 percent of actions within the identified rural interface areas which had design features or mitigation measures will be examined following completion to assess the effectiveness of the action.

Socioeconomic Conditions

Expected Future Conditions and Outputs

Contribution to local, state, national, and international economies through sustainable use of BLM-managed lands and resources and use of innovative contracting and other implementation strategies.

Provision of amenities for the enhancement of communities as places to live and work.

Implementation Monitoring

Questions

1. What strategies and programs have been developed, through coordination with state and local governments, to support local economies and enhance local communities?
2. Are RMP implementation strategies being identified that support local economies?

3. What is the status of planning and developing amenities that enhance local communities, such as recreation and wildlife viewing facilities?

Monitoring Requirements

1. The Annual Program Summary will address Implementation Questions 1-3.

Effectiveness and Validation Monitoring

Questions

1. What level of local employment is supported by BLM timber sales and forest management practices?
2. What were O&C and Coos Bay Wagon Road payments to counties?

Monitoring Requirements

Deferred to SEIS Monitoring Plan.

Recreation

Expected Future Conditions and Outputs

Provision of a wide range of developed and dispersed recreation opportunities that contribute to meeting projected recreation demand within the planning area.

Provision of nonmotorized recreational opportunities and creation of additional opportunities consistent with other management objectives.

Implementation Monitoring

Questions

1. What is the status of the development and implementation of recreation plans?

Monitoring Requirements

1. The Annual Program Summary will address Implementation Question 1.

Effectiveness and Validation Monitoring

Questions

1. Based on the Statewide Comprehensive Outdoor Recreation Plan, supply and demand data, and public comments, is the range of recreation opportunities on BLM lands (i.e., roaded vs. unroaded) meeting public needs?
2. Are BLM developed recreation facilities meeting public needs and expectations, including facility condition and visitor safety considerations?
3. Are Off Highway Vehicle designations adequate to protect resource values while providing appropriate motorized vehicle recreation opportunities?

Monitoring Requirements

1. Each Special Recreation Management Area will be monitored at least every three years to determine if the types of recreation opportunities being provided are appropriate.
2. All developed recreation sites will be monitored annually to determine if facilities are being properly managed and all deficiencies documented.
3. All Off Highway Vehicle designations will be reviewed annually to determine if revisions are necessary to protect resource values and resolve user conflicts.

Timber Resources

Expected Future Conditions and Outputs

Provision of a sustained yield of timber and other forest products.

Reduction of the risk of stand loss due to fires, animals, insects, and diseases.

Provision of salvage harvest for timber killed or damaged by events such as wildfire, windstorms, insects, or disease, in a manner consistent with management objectives for other resources.

Implementation Monitoring

Questions

1. By land-use allocation, how do timber sale volumes, harvested acres, and the age and type of regeneration harvest stands compare to the projections in the SEIS Record of Decision Standards and Guidelines and RMP management objectives?
2. Were the silvicultural (e.g., planting with genetically selected stock, fertilization, release, and thinning) and forest health practices anticipated in the calculation of the expected sale quantity, implemented?

Monitoring Requirements

1. The Annual Program Summary will report both planned and non-planned volumes sold. The report will also summarize annual and cumulative timber sale volumes, acres to be harvested, and stand ages and types of regeneration harvest for General Forest Management Areas, Connectivity/Diversity Blocks and Adaptive Management Areas, stratified to identify them individually.
2. An annual district wide report will be prepared to determine if the silvicultural and forest health practices identified and used in the calculation of the Allowable Sale Quantity were implemented. This report will be summarized in the Annual Program Summary.

Effectiveness and Validation Monitoring

Questions

1. Is reforestation achieving desired stocking?
2. Are stands growing at a rate that will produce the predicted yields?

3. Is the long-term health and productivity of the forest ecosystem being protected in the Matrix?

Monitoring Requirements

1. First, third, and fifth year surveys will be used to determine if reforestation is meeting reforestation objectives.

The balance is deferred to SEIS Monitoring Plan.

Special Forest Products

Expected Future Conditions and Outputs

Production and sale of special forest products when demand is present and where actions taken are consistent with primary objectives for the land use allocation.

Utilization of the principles of ecosystem management to guide the management and harvest of special forest products.

Implementation Monitoring

Questions

1. Is the sustainability and protection of special forest product resources ensured prior to selling special forest products?
2. What is the status of the development and implementation of specific guidelines for the management of individual special forest products?

Monitoring Requirements

1. The Annual Program Summary will address Implementation Questions 1 and 2.

Effectiveness and Validation Monitoring

Questions

1. Are special forest products being harvested at a sustainable level?

Monitoring Requirements

Deferred to SEIS Monitoring Plan.

Noxious Weeds

Expected Future Conditions and Outputs

Containment and/or reduction of noxious weed infestations on BLM-administered land using an integrated pest management approach.

Avoidance of the introduction or spread of noxious weed infestations in all areas.

Implementation Monitoring

Questions

1. Are noxious weed control methods compatible with Aquatic Conservation Strategy Objectives?

Monitoring Requirements

1. Review the files of at least 20 percent of each year's noxious weed control applications to determine if noxious weed control methods were compatible with Aquatic Conservation Strategy Objectives.

Effectiveness and Validation Monitoring

Questions

1. Are management actions effectively containing or reducing the extent of noxious weed infestations?

Monitoring Requirements

1. At least twenty percent of the noxious weed sites subjected to treatment will be monitored to determine if the treatment was effective.

Fire/Fuels Management

Expected Future Conditions and Outputs

Provision of the appropriate suppression responses to wildfires in order to meet resource management objectives and minimize the risk of large-scale, high intensity wildfires.

Utilization of prescribed fire to meet resource management objectives. (This will include, but not be limited to, fuels management for wildfire hazard reduction, restoration of desired vegetation conditions, management of habitat, and silvicultural treatments.)

Adherence to smoke management/air quality standards of the Clean Air Act and State Implementation Plan standards for prescribed burning.

Implementation Monitoring

Questions

1. What is the status of the preparation and implementation of fire management plans for Late Successional Reserves and Adaptive Management Areas?
2. Have additional analysis and planning been completed to allow some natural fires to burn under prescribed conditions?
3. Do wildfire suppression plans emphasize maintaining late-successional habitat?
4. Are Wildfire Situation Analyses being prepared for wildfires that escape initial attack?
5. What is the status of the interdisciplinary team preparation and implementation of fuel hazard reduction plans?

Monitoring Requirements

1. The Annual Program Summary will address Implementation Questions 1-5.

Effectiveness and Validation Monitoring

Questions

1. Are fire suppression strategies, practices, and activities meeting resource management objectives and concerns?
2. Are prescribed fires applied in a manner which retains the amount of coarse woody debris, snags, and duff at levels determined through watershed analysis?

3. Are fuel profiles being modified in order to lower the potential of fire ignition and rate of spread; and to protect and support land use allocation objectives by lowering the risk of high intensity, stand-replacing wildfires?

Monitoring Requirements

Deferred to SEIS Monitoring Plan.

Appendix V

Existing Withdrawals and Classifications

Withdrawals							
Authority ¹	T	Location R	S	Acreage ²	Purpose	Segregative Effect ³	Surface Management Agency
PSR* 629, WPD* 11	20S	7W	25	200.00	Protect Water Power & Reservoir Development Potential	C	BLM/FERC ⁴
			27	40.00			
			33	280.00			
			35	80.00			
PLO 3869	21S	6W	1	80	Gunter Recreation Site	B	BLM
PSR* 629, WPD* 11	21S	7W	5	352.59	Protect Water Power & Reservoir Development Potential	C	BLM/FERC ⁴
			9	40.00			
WPD* 15, PSR* 658	22S	5W	33		Transmission Line Purposes (unconstructed)	C	BLM/FERC ⁴
PSR* 633, WPD* 11	22S	7W	19	29.93	Protect Water Power & Reservoir Development Potential	C	BLM/FERC ⁴
			31	17.52			
PSR* 280, 633, WPD* 11	23S	7W	15	94.00	Protect Water Power & Reservoir Development Potential	C	BLM/FERC ⁴
			23	134.27			
			27	74.20			
			32	1.70			
			33	118.20			
PSR* 280, 633, WPD* 11	24S	7W	3	146.05	Protect Water Power & Reservoir Development Potential	C	BLM/FERC ⁴
			11	186.32			
			13	26.62			
			15	122.19			
			17	116.06			
			20	14.35			
			21	75.58			
			23	40.03			
			28	34.62			
			33	95.20			
PLO 3869	24S	7W	13	23.70	Tyee Recreation Site	B	BLM
PLO 754	24S	7W	20	14.35	Timber Preservation	A	BLM
			21	13.93			
PLO 3869	25S	1W	23	20	Scaredman Recreation Site	B	BLM
			24	40			
			25	20			
Executive Order* 865	25S	1W	27	200	Umpqua National Forest	None	USDA,FS ⁶
			30	40			

Withdrawals (continued)

Authority ¹	T	Location R	S	Acreage ²	Purpose	Segregative Effect ³	Surface Management Agency
PLO 3869	25S	2W	15	160	Rock Creek Recreation Site	B	BLM
			21	320	Mill Pond Recreation Site	B	BLM
PSR* 280, 630, 633, WPD* 11	25S	7W	5	37.00	Protect Water Power & Reservoir Development Potential	C	BLM/FERC ⁴
			6	105.25			
			7	205.49			
			9	78.39			
			15	13.83			
			17	80.00			
			21	40.00			
			23	80.00			
PLO 4537	25S	7W	9	78.40	Umpqua Recreation Site	B	BLM
			10	0.15			
			15	13.33			
PSC* 162,	25S	8W	12	20.80	Protect Water Power & Reservoir Development Potential	C	BLM/FERC ⁴
Public Law* 100-557	26S	2W	7,8,13,14, 15,16,17, 18,20,21, 22,23,24	1620	North Umpqua Wild and Scenic River	C	BLM
PP 1927*	26S	2W	7	110.11	Electric transmission line. Occupies 100 foot wide strip of land.	B	BLM/FERC ⁴
			13				
			14				
			15				
			17				
			21				
			29				
			30				
PSC* 416, PSR* 631, 280 WPD* 11, 16	26S	2W	7	397.30	Protect Water Power & Reservoir Development Potential	C	BLM/FERC ⁴
			13	40			
			14	300			
			15	160			
			17	280			
			21	33.78			
			22	220			
			23	353.94			
24	250						
PLO 3869	26S	2W	14	160	Susan Creek Falls	B	BLM
			23	45.21			
PP* 1927	26S	3W	1	5.88	Electric Trans- mission line. Occupies 100 foot wide strip of land.	B	BLM/FERC ⁴
			35	6.29			

Withdrawals (continued)

Authority ¹	T	Location R	S	Acreage ²	Purpose	Segregative Effect ³	Surface Management Agency
PLO 4848	26S	3W	1	80	Swiftwater Recreation Site	B	BLM
PLO 3869			9	6.44	Lone Rock	B	BLM
PSR* 631, 280 WPD* 11 SO Intrpr* 83	26S	3W	1 9 11	120 25 + 121.44	Protect Water Power & Reservoir Development Potential	C	BLM/FERC ⁴
PSR* 631, WPD* 11	26S	4W	17	11.56	Protect Water Power & Reservoir Development Potential	C	BLM/FERC ⁴
PSR* 280, 633, WPD* 11	26S	6W	7 8	139.87 62.43	Protect Water Power & Reservoir Development Potential	C	BLM/FERC ⁴
PLO 4521	27S	2W	1	0.80	Negro Creek Road	B	USDA,FS
Executive Order* 865	27S	2W	9 32 33	320.4 110.25 308.03	Umpqua National Forest	None	USDA,FS
PLO 4848	27S	2W	1 8	80 80	Emile Creek Recreation Site Little River Wayside	B B	BLM BLM
PLO 3869			16	178.53	Wolf Creek Trail	B	BLM
PLO 3869	27S	3W	23	80	Cavitt Creek	B	BLM
Executive Order* 865	28S	2W	30	320.15	Umpqua National Forest	None	USDA,FS
PLO 4448	29S	7W	17 21	40 20.22	Umpqua River Reclamation Project	B	BR ⁵ BLM
PSR* 659, WPD* 14	29S	9W	35	40	Protect Water Power & Reservoir Development Potential	C	BLM/FERC ⁴
PLO 4448	29S	7W	32	58.43	Umpqua River Reclamation Project	B	BR ⁵ BLM
PSC* 198, 315, PSR* 280,	30S	2W	12 23 28 29 31	80 80 40 120 80	Protect Water Power and Reservoir Development Potential	C	BLM/FERC ⁴

Withdrawals (continued)

Authority ¹	T	Location R	S	Acreage ²	Purpose	Segregative Effect ³	Surface Management Agency
PLO 4626	30S	2W	23	1.3	Pickett Butte Road	B	USDA,FS
PSC* 315, PSR* 659, WPD* 11	30S	3W	19 25	120 120	Protect Water Power and	C	BLM/FERC ⁴
			29 31 33 35	80 164.62 40 80	Reservoir Development Potential		
	30S	4W	15 21 23 25 27 29 35	99.34 80.14 161.95 112.76 40.00 76.84 167.76	Protect Water Power and Reservoir Development Potential	C	BLM/FERC ⁴
PLO 4448,	30S	7W	5 6	20 31.15	Umpqua River Reclamation Project	B	BR ⁵
PSR 659, WPD 14	30S	9W	3	40	Protect Water Power and Reservoir Development Potential	C	BLM/FERC ⁴
PSC* 315	31S	3W	3	83.61	Protect Water Power and Reservoir Development Potential	C	BLM/FERC ⁴
PLO 3869	31S	8W	35	20	Darby Creek Recreation Site	B	BLM
PLO 5490	All Public Domain (PD) lands			18,426	Multiple Use	D	BLM
Small Tract Act	T 24 S, R 7 W, Sec 3; Lot 3			4.43	Community Site Lease OR 011654	B	BLM
Recreation and Public Purpose Act	T 26 S, R 2 W, Sec 7; E1/2SE1/4			7.50	County Park	B	BLM Lease OR 012162
Recreation and Public Purpose Act	T 26 S, R 2 W, Sec 23 and 24; Metes and Bounds			147.99	State Park Lease (expired) OR 010044	B	BLM
Small Tract Act	T 28 S, R 7 W, Sec 15; Lot 6			2.69	Occupancy Lease OR 05564	B	BLM

Withdrawals (continued)

Authority ¹	Location			Acreage ²	Purpose	Segregative Effect ³	Surface Management Agency
	T	R	S				
Small Tract Act	T 28 S,	R 4 W,		0.61	Occupancy Lease OR 16775	B	BLM

Segregative Effect Acreage Summary³:

	A	B	C	D
District Total:	28.28	1,943.65	9,102.53	18,426.00

* Withdrawals remaining to be reviewed through the FLPMA withdrawal review process.

¹ Authority Abbreviations:

- PLO - Public Land Order
- PSC - Power Site Classification
- PSR - Power Site Reserve
- WPD - Water Power Designation
- PP - Power Project
- SO Intpr - Secretarial Order Interpretive

The Water Power Designations, Power Site Reserves, Power Site Classifications and S.O. Interpretive Withdrawals have similar segregations. These withdrawals are listed together on a township basis. Note all of the listed withdrawals apply to every section listed under that township.

² Table does not include lands that have been transferred out of federal ownership subsequent to withdrawal which are subject to Section 24 of the Federal Power Act (U.S. Congress 1920).

³ Segregative Effect:

- A. Withdrawn from operation of the general land laws, the mining laws and the mineral leasing laws.
- B. Withdrawn from operation of the general land laws and the mining laws.
- C. Withdrawn from operation of the general land laws only.
- D. Withdrawn from operation of the general land laws, but not from the R&PP Act (U.S. Congress 1926), sales or exchanges.

⁴ Federal Energy Regulatory Commission.

⁵ Bureau of Reclamation.

⁶ US Department of Agriculture, Forest Service

Appendix W

Right-of-Way Agreements

Permittee Name	Permit Number	Date Signed
Anderson	790	9/18/64
Aarant Lumber Co.	920	12/15/78
Madison-Beck	711	7/3/63
Bellows	784	3/1/66
Bohemia	938	11/17/72
Brand S. Corp.	854	8/15/67
Brazier	1083	5/30/80
Byron-Moody	1154	12/5/86
Danielle	1226	8/21/91
Dodd	906	12/5/69
Douglas Co. Lbr.	526	9/9/59
Dysert	744	8/2/63
Engle Const.	1113	11/22/82
Ford, Kenneth	680	5/8/63
Formosa Exploration Inc.	1099	5/12/81
Glenbrook Nickel Co.	1163	2/14/89
Haines	589	3/3/61
Harris	581	5/1/61
Hendy	674	4/24/63
Henry, Dean	257	3/10/54
Hoppe, W.H.	353	8/8/55
Hunt	1117	6/3/82
International Paper	659	7/1/64
International Paper	771	7/3/63
ITT Rayonier	1202	5/21/91
Jones, Aaron U.	645A	6/27/62
Juniper Properties	645P	6/27/62
Juniper Properties	763	1/26/65
Keller	792	12/8/65
Lone Rock Timber	543	4/8/60
Lone Rock Timber	585	12/15/60
Lone Rock Timber	700	11/7/62
Lone Rock Timber	767	5/15/64
Lone Rock Timber	768	9/17/64
Lone Rock Timber	888	11/21/68
Lone Rock Timber	914	1/12/70
Lone Rock Timber	976A	1/28/81
Mack	845	12/20/67
McKenzie	1179	1/6/89
Messing	1110	1/6/89
Michaels	798	3/25/65
Monger	765	4/2/64
Mt. Baldy	491	9/3/58
Murphy Co.	1115	4/21/82
Newton	1160	5/4/87
Ray, Darryl	600	1/13/61

Permittee Name	Permit Number	Date Signed
Reservation Ranch	1145	7/2/86
Rosboro Lumber Company	1222	8/5/91
Roseburg Resources	531	12/10/59
Roseburg Resources	617	2/20/66
Roseburg Resources	700	11/7/62
Roseburg Resources	735	2/10/64
Roseburg Resources	751	7/7/64
Roseburg Resources	851	8/15/67
Ross	1149	7/6/89
Seneca Timber Company Limited Partnership	490	8/22/58
Seneca Timber Company Limited Partnership	573	8/18/60
Seneca Timber Company Limited Partnership	642	4/3/62
Seneca Timber Company Limited Partnership	646	4/3/62
Seneca Timber Company Limited Partnership	656	4/3/62
Seneca Timber Company Limited Partnership	697	11/19/62
Seneca Timber Company Limited Partnership	769	7/7/64
Seneca Timber Company Limited Partnership	773	7/6/64
Seneca Timber Company Limited Partnership	788	2/1/65
Seneca Timber Company Limited Partnership	791	2/1/65
Seneca Timber Company Limited Partnership	912	1/17/75
Seneca Timber Company Limited Partnership	913	8/17/77
Silver Butte Timber Co.	824	12/20/66
Starfire Lbr. Co.	1178	1/12/89
South Fork Lbr.	548	7/13/60
Suntal Trust	640	10/5/61
Superior Logging Co.	1023	12/15/77
Superior Logging Co.	976B	1/28/81
Swift, Earl	254	2/25/54
U.S.F.S.	724	3/14/61
Warren & Davis	672	11/14/63
Western Timber Co.	809	7/20/65
Western Timber Co.	1143	11/26/85
Western Timber Co.	565	7/20/60
Weyerhaeuser	540	3/11/60
Weyerhaeuser	698	2/14/66
Weyerhaeuser	863	8/15/69
Weyerhaeuser	957	3/5/74
Weyerhaeuser	1022	2/10/78
Whipple	715	3/7/63
Whipple	846	5/2/67
Whipple, Carol	645TC	6/27/62
Whipple, Robert J.	421	1/25/57
Whipple Trust	645T	6/27/62
Wilson	664	6/1/62
Wood & Sons	669	6/5/62
Norman Wood	832	5/17/66
Woolley Ent.	645D	6/5/62
Zellner	571	8/8/60

Appendix X

Water Resources

Summary of Basic Principles

The beneficial uses of water resources primary concern related to land management activities are rearing and spawning habitat for salmonids, domestic water supply, fishing, and water contact recreation. In all of these uses, high quality water is important.

Forest hydrology is a collection of complex processes which transform precipitation to streamflow or groundwater.

Precipitation

Oregon's latitude, topography, and location near the Pacific Ocean have a great influence upon its climate. The Coast Range and Cascade mountains play a major role in rainfall patterns. As moisture laden air travels inland from the ocean, it ascends to cross the mountains. As it rises, the moisture cools and condenses, falling as rain or snow. Large accumulations of snow occur during winter months in the higher elevations, generally above 4,000 ft.

Oregon's rainfall pattern gives BLM's Roseburg District a plentiful water supply during October through May, when 92 percent of annual precipitation is received. June through September are generally dry months. This is because in winter the active Pacific storm systems move south, providing frequent rain, while in summer the storm track moves north into Canada. This gives the Roseburg area lots of sunny, warm to hot summer days. The annual precipitation in the district ranges from a high of 80 inches to a low of 30 inches.

Precipitation is an important climatic variable that influences the productivity and management of forest lands. The distribution of vegetation and the rates of forest growth are strongly affected by the generally moisture limiting, mediterranean climate of the Roseburg District. Estimates of precipitation are used for planning numerous forest management activities such as the location, design, and maintenance of forest roads, and the selection and scheduling of harvesting and reforestation systems.

Interception occurs when rain or snow lands on vegetation rather than the ground. Some of this intercepted water evaporates and the remainder falls to the ground. Evaporation of water also occurs from surfaces of water bodies and soil surfaces. Under forested conditions, evaporation from soil surfaces is minimal. The process by which water is taken up by plants and discharged to the atmosphere is known as transpiration.

Infiltration is the movement of water into the soil surface. When the rainfall rate exceeds the rate of infiltration, water will travel over the ground surface to a channel. This is known as overland flow. Infiltration rates usually far exceed the maximum rates of rainfall in undisturbed forest soils in western Oregon, thus allowing all water that reaches the earth's surface to enter the soil.

Infiltration rates are reduced by soil disturbing activities such as road building and tractor logging. These activities tend to compact the soil surface causing some water to flow overland until it reaches nearby undisturbed soils or a stream channel.

Removal of forest vegetation drastically reduces the amount of precipitation which returns to the atmosphere as a result of interception and transpiration. This allows more precipitation to reach the soil surface and drain into streams or become groundwater. The return of vegetation results in annual streamflows decreasing to preharvest levels as both interception and transpiration increase. Evaporation from the soil surface is generally increased after timber harvest, however, this increase is greatly offset by the reduction in transpiration.

Streamflow

The amount of water draining from a given area in a year is referred to as the annual water yield and is usually expressed in acre-feet (43,560 cubic feet) or the average depth over an area in inches. The annual yield of an area can be converted to the average annual flow (in cubic feet per second (CFS)) of the stream draining the area. Streamflow is the water which reaches the stream channel. Total streamflow is a product of all the other processes in the hydrologic cycle. Distribution of annual streamflow in

western Oregon is closely related to the distribution of annual precipitation, thus high flows are observed during the winter and low flows are predominant in the summer.

The effect of timber management activities (road construction, timber harvest, and slash disposal) on streamflow in small headwater basins is primarily related to removal of forest vegetation and disturbance of the natural soil surface. Studies of clearcutting small watersheds in western Oregon showed that annual water yields from clearcut areas increased 26 to 43 percent (Harris 1977; Rothacher 1970; Harr et al. 1979).

The amount of increase in streamflow resulting from removal of forest vegetation is proportional to the type of harvest, the area harvested within a specific watershed, and the time since harvest. Streamflow increases are most noticeable in small watersheds which have large areas of vegetation removed over a short time period. Streamflow increases in large basins tend to be masked because the nonvegetated area is small relative to the size of the basin.

The duration of increased water yield is not easily predicted; however, Harr (1983) found that 27 years (30 years in SW Oregon) would be required for water yield increases to disappear. Increases in streamflow due to vegetation removal are not distributed evenly throughout the year. Increases in summer flows appear large when compared to the naturally low levels of streamflow during the summer months. The increases in summer streamflow result from greatly reduced transpiration allowing more water to drain through the soil to the streams. Summer increases are relatively short-lived because of the rapid growth of vegetation along stream channels.

Increases in streamflow following timber removal are greatest in fall because soil moisture content on the harvested areas is higher than it was under forested conditions. Therefore, a smaller amount of fall rains is used for soil moisture recharge and a larger proportion becomes streamflow. Timber removal has little effect on the size of large peak flows which cause extensive downstream flooding. Large peak flows are caused by such great amounts of precipitation that differences in soil moisture content between harvested and forested areas become insignificant and both areas respond nearly the same.

Soil disturbance may have an influence on the frequency and magnitude of small and large peak flows. The degree of influence depends upon the amount of area compacted by haul roads and tractor

skid roads, and the proximity of the compacted area to stream channels.

Recent watershed studies have shown that timber harvest in the transient snow zone has increased the magnitude of peak flows. The transient snow zone is located at elevations where the snow level fluctuates throughout the winter in response to alternating warm and cold fronts. In the Roseburg District the transient snow zone has been observed between elevations of 2,000 and 5,000 feet. Snow accumulation is greater in clearcut openings than in undisturbed forest. Rain-on-snow events result in rapid melting of these shallow snowpacks. More snowmelt is generated from clearcut openings than from forested areas resulting in larger peak flows.

Streamflow does not always increase following the removal of vegetation. In some areas, reduced fog interception and drip following logging apparently reduces annual precipitation enough to offset expected reductions in transpiration. In coastal areas, fog drip may account for as much as 30 percent of the total water reaching the forest floor; thus, removal of forest vegetation may actually decrease annual streamflow (Harr, 1983B).

Water Quality

Stream temperature, turbidity, sediment, dissolved oxygen, and chemical water quality are important water quality parameters to observe, since they indicate the ability to protect those beneficial uses listed in the OAR, Chapter 340-41.

Streams flowing from undisturbed forests generally have excellent quality. This characteristic makes streams valuable for domestic water supply, fish production, and recreation. Natural processes such as surface erosion, landslides and flood events can increase sediments in stream channels, causing a detrimental effect on water quality.

Sediment and water temperature are the two water quality factors influenced most by timber harvest and road construction.

Units of Measurement

Water temperature is measured in degrees Fahrenheit (°F) or degrees Celsius (°C); turbidity is measured in Jackson or Nephelometric Turbidity Units (JTU or NTU); conductivity is measured in microseimens (uS); and bacteria are measured in

number of organisms per 100 milliliters (MI). Most chemical parameters of interest, as well as most sediment data, are reported in terms of concentrations, discharge, or yield. Water quality data is usually reported as concentrations or weight per unit volume (usually milligrams per liter (mg/l) or micro-grams per liter (ug/l)). In the dilute waters of western Oregon, mg/l equals parts per million (ppm), and micro-grams per liter equals parts per billion (ppb). Frequently, in the case of sediment and occasionally in the case of chemicals, data is expressed in terms of discharge (i.e., weight or volume per unit time tons per day or cubic feet (cf) per year). Occasionally sediment or chemical data is also expressed as yield (i.e., weight or volume per unit area of the watershed-tons per acre or acre-feet per square mile or kilograms per hectare).

Stream Temperature

Timber harvest affects stream temperature by removing shading vegetation from streambanks. Stream temperature increases of 10° F or more have been recorded following removal of streamside vegetation by clearcutting and burning in both the Oregon Cascades and Coast Range (Brown and Krygier 1970; Leuno and Rothacher 1969). Because downstream shading does not significantly lower temperatures of streams warmed by upstream exposure (Brown, 1970), water temperatures of larger streams can also increase when small tributaries are exposed by clearcutting. The magnitude of this effect is dependent on the temperature and quantity of groundwater inflow, as well as inflow from other well shaded tributaries. The primary concern with water temperature increases is the potential for detrimental effects on fish and other aquatic organisms.

Chapter 340 of the OAR sets standards for water temperature in streams. These standards require no measurable increases when stream temperatures are 58° F or greater, and in no case may the increase in water temperature be more than 2°F. For application of the standards, maximum summer stream temperatures may be estimated with an equation developed by Schloss (1985), and temperature increases from removal of shading vegetation may be estimated from an equation developed by Brown (1970). Recent computer models, such as the one developed by Beschta (1984), may be used to estimate both ambient stream temperatures and changes resulting from management, for both individual stream reaches and networks of streams.

Sediment

The larger peak flows described above have a direct relationship to increases in the amount of sediment transported downstream.

Peak flows may result in streambank erosion and scouring of channel beds. Forestry practices may also influence sediment entering streams by causing surface erosion or landslides. The occurrence of surface erosion or landslides resulting from forest management activities is dependent on natural rates of surface erosion and landslide frequency, climatic factors, and the type of activity. Landslide prone areas are avoided if possible in timber harvest and road construction. Roads continue to be a major source of stream sedimentation.

Sediment clouds water, chokes fish gills, blankets fish spawning areas, and smothers bottom aquatic habitats. Sediment also increases the cost of treating drinking water. Chemicals, such as pesticides and nutrients, often bind to sediment particles.

Soil erosion is the main source of sediment in water. Some soil is eroded naturally through weathering processes of rain and wind. But the main causes of soil loss are agricultural practices, timber harvesting, road and building site construction, and mining activities.

Timber management (road construction, timber harvest, and slash disposal) and other ground-disturbing activities can affect sediment levels in district streams by increasing the capacity of the streams to entrain and transport sediment and by increasing the supply of sediment available for transport. Forest management related sediment problems can be reduced by carefully constructing logging roads and stream crossings, installing culverts to carry runoff, and providing wide set-backs (buffer zones) from streams when timber is harvested.

Construction and mining activities typically disturb large tracts of land, which contribute to sediment problems.

Instream sediment levels are both transport (flow) and supply dependent. Paustian and Beschta (1979), VanSickle and Beschta (1983) and Jackson and Beschta (1982) described bedload transport in terms of supply of material available for transport at various levels of flow; they found that most bedload transport occurred during short periods of high water, when flows were sufficient to entrain coarse, armoring riffle

sediments, and access supplies of finer material within the riffle. Subsequent studies (Jackson and Beschta 1984) have demonstrated that increased amounts of sand in transport can cause previously stable, coarse riffle sediments to undergo scour.

These data reveal that the effects of management activities on sediment transport are directly related to the effects on high flow events. The result of increased high flow events would be increased sediment concentrations and more frequent episodes of riffle scour and fill.

The effect of management activities on the supply of sediment available for transport depends on the average slope of the contributing area and the type of erosion processes dominant in the area of the activity. On gently sloping topography with competent bedrock, little if any increased erosion would be expected (Fredriksen and Harr 1979). On steeper slopes, surface erosion (known as dry ravel) occurs, especially after slash burning. It is not known how much of this eroded material reaches streams and becomes sediment. In areas where debris avalanching is the dominant erosion process, clearcutting has increased the natural rate of avalanching two to four times, and road building can increase the natural rate of erosion as much as 25 to 340 times (Fredriksen and Harr 1979). They also reported that mean-annual suspended sediment concentration in a clearcut watershed, without roads, was about nine times the natural concentration (in an undisturbed forest), and mean-annual sediment concentration in a patchcut watershed, with roads, was about 23 times the natural concentration.

Roads sometimes contribute to increased sediment concentrations because of erosion from the road surface, cut slopes, and fill material. Road construction can increase erosion as much as 250 times in the first storms after construction, but concentrations usually drop off within a few months to two years (Brown 1983). More extended periods of sediment increase may be associated with heavy truck road use during very wet weather, on poorly surfaced roads, or with unauthorized off highway vehicles use. Compacted soils (from roads, skid trails, or heavy equipment use) can cause gully erosion and locally large increases of sediment.

Nutrients

Nutrients enter water mainly from treated municipal sewage discharges, failing septic tank systems, and from fertilizers washed into the water by rain or

irrigation. Excessive amounts of nutrients released into slow moving waters during spring and summer can result in growths of algae and aquatic weeds. Algae blooms reduce the amount of oxygen available to fish, which can result in fish kills.

To address this problem of algae growth, the Oregon Environmental Quality Commission (EQC) adopted a chlorophyll standard. The amount of chlorophyll in water indicates the amount of aquatic plant growth. Waters violating this standard will be studied to determine the nutrient sources and options for controlling the problem. Lakes undergo a natural aging process which can be accelerated by human activities. Improper agricultural, forestry, and other land use practices cause soil erosion which can introduce sediment and nutrients into the lake.

Sediment from soil erosion can rapidly fill a lake or reservoir, while nutrients increase the frequency of algal blooms and accelerate aquatic weed growth.

Shallow, nutrient-rich lakes often have impaired recreational and aesthetic values. This is especially true for lakes that are 'old' in their stage of development; which means they have high nutrient levels and are naturally more marshlike.

Timber Harvest and Slash Disposal

Timber harvest and slash disposal can affect the chemical quality of surface water. In one Oregon Cascades watershed following slash burning, instream concentrations of ammonia, nitrogen, and manganese reached peak levels of 7.6 and 0.44 mg/l respectively (Fredriksen 1971). Fredriksen attributed the high concentrations of ammonia, nitrogen, and manganese to burned slash in stream channels.

The aerial application of herbicides is another management activity that can affect the chemical water quality of streams in the district. A detailed discussion of potential water quality impacts of herbicides proposed for use by the BLM is beyond the scope of this analysis, but the reader is referred to the Final Environmental Impact Statement (FEIS) for the Western Oregon Program for the Management of Competing Vegetation (USDI, BLM, OSO 1989).

Application of nitrogen fertilizers also affects the chemical water quality of streams in the district. Nitrogen is usually added to the soil by aerial

application of urea pellets. Since direct fertilizer application is the major pathway for urea entry to streams, urea concentrations usually peak within one to two days following fertilizer treatment. Ammonia nitrogen, a hydrolysis product of urea, also usually peaks shortly after treatment, since it is derived from urea entering the stream.

Ammonia nitrogen in the soil is held very tightly. Only nitrate nitrogen is readily leached from the soil, and this usually occurs after the ammonia is oxidized to nitrate during the warm growing season. For this reason, peak nitrate concentrations are often recorded one to two years after fertilization. On the other hand, if nitrogen fertilizer is applied shortly after an area has burned, the warm soil temperatures may enhance nitrification and subsequent leaching of nitrate to the stream. Moore (1975) summarized several water quality monitoring studies of forest fertilization with urea throughout the Pacific Northwest and found maximum recorded nitrate values were usually less than one mg/l and in all cases were less than five mg/l.

Stream Categorization

Streams are characterized by their 'order' (Strahler 1957). Headwater stream channels are designated first order; two first order streams combine to form a second order stream. Two second order streams combine to form a third order, and so forth.

In western Oregon, first and second order streams constitute 79 percent of the total stream mileage (Boehne and House 1983). Such streams rise in very small watersheds with limited water storage capacity. These streams may have only scanty or intermittent flow during the dry season, but during high flows they may move large amounts of sediment and woody debris. Headwater streams mainly determine the type and quality of downstream fish habitat.

First and second order streams are influenced by the geomorphology, soils, and vegetation of their channels. Large woody debris is common, covering as much as 50 percent of the channel (Anderson and Sedell 1979, Swanson and Lienkaemper 1978, Triska and others 1982). The stream is continuously shaded by vegetation. Flow energy in the channel is continually dissipated by woody material and vegetation that slow erosion and foster deposition of organic and inorganic materials. The average gradient of these streams often exceeds ten percent, but the channels usually have a staircase configuration of flat reaches connected by riffles and

low falls. Salmonid reproduction may be sufficient, even in some ephemeral streams, to furnish fry to larger waters downstream (Everest 1973, Everest and others 1985).

Third and fourth order streams usually flow continuously. Average gradient is less than five percent, but there may be intermittent stretches of rapids or falls. Woody debris usually covers less than 25 percent of the channel. High flows may flush woody material from the system or deposit it in debris jams. The vegetative canopy over third and fourth order streams varies in density. These streams can transport large amounts of sediments, which are often deposited around channel obstructions, in narrow, winding areas, or in other areas of low velocity such as accretion bars and the flood plain.

The direct influence of riparian zones is moderated in fifth order and larger streams but remains important. Canopies of large, old-growth trees provide some shade, vegetated riparian zones keep the main channel confined, and the largest stems of down trees that remain in the stream provide important summer and winter salmonid habitat. Flood plains of the larger streams contain complex arrays of side channels, overflow channels, and isolated pools. Side channels are often created and maintained by large woody debris (Bisson and others 1987, Sedell and others 1984). The gradient in large streams is usually less than one percent, but rapids and falls may occur. Alluvial material and woody debris may be deposited in quiet areas, but accumulations are flushed and rearranged during high flows (Sedell et al. 1988).

Riparian Zone

The BLM defines riparian zones as an area of land directly influenced by permanent water. It has visible vegetation or physical characteristics reflective of permanent water influence. Lake shores and stream banks are typical riparian zones. Excluded are such sites as ephemeral streams or washes that do not exhibit the presence of vegetation dependent upon free water in the soil.

Riparian zones are the green zones along the banks of creeks and rivers and around springs, bogs, wet meadows, lakes, and ponds. In the Roseburg District some riparian areas are characterized by a zone of deciduous trees and shrubs located between the stream and the conifer forest. Others in more xeric sites are largely nondescript with conifers growing to the edge of streams without much deciduous growth.

Riparian zones are unique and among the most productive and important ecosystems on lands managed by BLM. They display a greater diversity of plant and wildlife species and vegetation structure than adjoining ecosystems.

As transition zones between terrestrial and aquatic systems, riparian areas influence exchanges of energy and materials between these systems and offer unique habitats attractive to many species (Naiman et al. 1988). Sediments and organic matter moving down slope often accumulate in riparian zones causing them to be sites of high forest productivity. The characteristics of riparian zones influence the composition of aquatic communities and rates of stream ecosystem processes: litter production and shading by streamside vegetation regulates water temperature and light available for in-stream primary production. Conversely, stream erosion and deposition represent disturbances in riparian zones and produce streamside vegetation that is structurally and compositionally complex (Hansen et al. 1988).

Riparian vegetation along upper watershed streams can absorb and dissipate the energy of flood waters before they reach high value agricultural and residential lands in lower valleys.

Many wildlife species are dependent upon the unique and diverse habitat niches offered by riparian zones. These habitats provide food, water, shade, and cover and are valuable sources of forage for big game animals. Riparian vegetation is of critical importance for fish, especially salmonids. The vegetation provides escape cover, lowers summer water temperatures through shading, reduces stream bank erosion that can silt in spawning and rearing areas, and provides food material for insects, which are in turn a food source for fish. Riparian zones are also focal points for recreation, including fishing, camping, boating, swimming, hiking, and simple relaxation.

Healthy riparian systems purify water as it moves through the vegetation by removing sediment, and providing sponge-like water retention in streambanks and groundwater aquifers.

More recently, the role of riparian forests as filters for nutrients has gained recognition, particularly in connection with agricultural operations. Studies in Maryland and France indicate a ten-fold decrease in nutrient concentrations as well as sediment load across riparian forests. Part of the decrease in nutrients is attributable to uptake by trees, which are important sinks for nitrogen and phosphorus. Bacterial denitrification is another important sink for

nitrogen. Soils that are frequently saturated and high in organic matter, such as those often found in riparian forests, are conducive to denitrification (Ice 1990).

Streamside vegetation affects nutrient loss from basins both directly through root uptake and indirectly via influences on aquatic plants and inputs of woody debris and leaves. Riparian vegetation can remove more than 75 percent of the nitrogen moving from upslope down into stream channels. More than 90 percent of added nitrogen can be removed within 300 m in streams with complex flood plains. Canyon reaches in the same streams removed less than 25 percent of added nitrogen.

In a first order watershed in the Cascade Mountains, more than 50 percent of the nitrogen entering the stream in groundwater was removed before leaving the watershed. Streams and floodplains have a high potential to retain both particulate and dissolved nutrients (Gregory 1989).

Riparian zones may support greater annual growth rates for individual trees on favorable growing sites, but this may be negated by higher mortality in the streamside environment and the abundance of locally unsuitable growing sites.

Two recent studies found that riparian forests contained lower abundances of conifers in stream side forests than in adjacent upslope forests. In four stands that were older than 90 years, the total conifer basal area was 65 percent of that estimated for the upslope forests (Andrus and Froehlich, 1988). Conifers in riparian areas need to reach 150 - 200 years of age in order for streams to reach maximum production potential regarding bio-mass, bio-diversity, and species richness (G. Reeves personal communication).

Because riparian forests may support lower timber volumes, the proportion of total forest timber volume contained in riparian management zones may be less than acreage alone would indicate. In most western Oregon forests, riparian zones comprise well less than ten percent of the general forest, but provide numerous resource values for water quality, fisheries, and wildlife (Gregory and Beschta et al 1990). Although riparian forests may have lower volumes of trees than upslopes, riparian plant communities are still ecologically important not only for fish and wildlife but also for terrestrial plant communities. The study of riparian plant communities in the McKenzie River drainage found that the number of terrestrial plant species in riparian areas is more than twice that of upslope forests (Gregory and Beschta et al 1990).

With changing land use and climate, the rich pool of species in riparian forests may be a critical resource for maintaining the diversity of terrestrial plant communities over the forest as a whole.

The economic benefits of retaining conifers in riparian zones as habitat for anadromous fish was compared to maximum timber production in a western Oregon study. The benefits of maintaining the conifers so they contributed to large woody debris in the stream was calculated to be 11 percent greater by year 20 and 59 percent higher after 94 years (an increase of over \$100,000 at present value) over conifer stumpage in the riparian zone (House and Crispin 1990).

More important to resource management, however, is the ecological rationale for a protective vegetation zone along streams and rivers of all sizes. Streamside vegetation zones are justified on the grounds of stream temperature control, stream bank stabilization, water quality protection, and food resources. Streamside vegetation is also the primary supplier of large organic debris; snags or tree stems eight inches in diameter with root wads attached or tree branches more than eight inches in diameter.

Erosion may contribute debris to streams and account for water transporting pieces of debris. Organic debris in streams increases aquatic habitat diversity by forming pools and protected backwater areas, provides nutrients and substrate for biological activity, dissipates energy for flowing water, and traps sediment (Maser, Tarrant, Trappe and Franklin).

First and second order streams feed third and fourth order streams with partially used food, the amount of which becomes progressively smaller as stream order increases. Small streams derive much food for invertebrates from wood or leaf litter under old-growth forests. The forest influence diminishes as streams become progressively larger and the stream energy base comes more from algae and less from forest litter. The forest influence is greatest in very small streams, but most diverse organic input mechanisms and habitats are in third to fifth order streams.

Geomorphic and Hydrologic Function

Stream riparian areas have important geomorphic and hydrologic roles that support their high level of biological productivity. The most productive stream riparian areas are often associated with alluvial

stream systems. That is, they are deposition zones and occur in fluvial sediments transported and reworked by the stream. A major role of the riparian area is to function as a flood plain and dissipate stream energies associated with high flows. This, in turn, permits sediments to deposit and continue development of the alluvial valley floor.

Alluvial riparian areas also function as shallow aquifers that recharge at high flows and drain at low flows. This interaction between surface flows and ground water storage results in moderated high flows and enhanced or prolonged base flows. The shallow aquifer condition also creates the moist soil conditions required for plant growth, which characterize riparian areas. Thus, it is the geomorphic and hydrologic characteristics of riparian areas that establish the basic components of biological habitat, including wet soils and in-stream structural features such as pools, riffles, gravel, and stream banks. The vegetation that thrives in riparian areas, in turn, contributes to their proper geomorphic and hydrologic functioning. Disruption of normal geomorphic or hydrologic function, or the vegetation on which it depends, usually results in impairment of overall riparian resource values.

Geomorphic structure, such as pools and flood plains, strongly influence stream and riparian ecosystems. This is particularly true in steep, mountain valley floors typical of the coast range and west slope of the Cascades where floods and debris flows can damage riparian vegetation and alter aquatic habitat on a frequency of years to decades.

The frequency and extent of disturbance, accessibility of riparian areas for wildlife, and magnitude of vegetation influence on stream ecosystems, varies as a function of drainage area and the associated variables of stream channel and valley floor widths. Another important source of structural variability along streams is exogenous (non-fluvial) factors such as bedrock outcrops and large hillslope landslides. Areas of very narrow valley floors can occur along headwater channels in V-shaped valleys or in bedrock or landslide controlled gorges along larger channels. Such areas may have extensive topographic shading, little opportunity for resetting of riparian vegetation by floods, little riparian habitat, and the environmental gradients for terrestrial wildlife are abrupt. In wider valley floors, on the other hand, channels can move laterally, creating complex mosaics of vegetation and secondary channels which are rich aquatic and terrestrial habitat. If only fluvial processes have formed valley floor landforms and there has been no significant influence of variation in bedrock hardness, hillslope landslides, and other

exogenous factors, valley floor and channel widths are likely to increase uniformly in the downstream direction. Channel and valley floor conditions may vary greatly from one geologic terrain to another (Hansen et al 1988).

A buffer zone of 2.5 to 3 tree heights (approximately 400-500 feet) is required to protect streamside riparian zones from changes in microclimate and wind damage that can threaten the integrity of vegetative structure and species composition. (Personnel communication Franklin, J.F. and Reeves, G.). Microclimate impacts to riparian zones include not only increased water temperature caused by solar radiation, but higher water temperatures due to elevated air temperature-water surface contact. Convection water temperature increases of up to 20°F have been documented in western Oregon (Leuno and Rothacher 1967). Another microclimate change is caused by reduced humidity which can cause compositional changes in vegetative species. This can alter allochthonous sources for a food chain based on decaying leaves and benthic invertebrates. This has potential impacts to fisheries.

Subterranean invertebrates thrive in a maze of underground channels that flow among the gravel, sands and rock that underlie many streams and rivers. These underground waterways can be as deep as 30 feet and can extend sideways for miles from the stream channel.

In this understream area called the hyporheic zone many types of small blind shrimp, primitive worms, bacteria, algae, and various kinds of immature insects live. These underground animals support a food chain that extends to the surface. The hyporheic zone serves as a refuge for creatures during times of drought or stress; and after floods streams may rely on the life underground to assist in repopulation of aquatic invertebrates. The underground system is rich in bacteria that fix nitrogen, which is in great demand by surface organisms.

Timber management activities (road construction, timber harvest, and slash disposal) remove riparian vegetation, constrain natural stream channels, and alter stream banks and channel structure at stream crossings.

Debris torrents, often caused by clearcut timber harvesting techniques and/or road construction in very steep terrain, scour stream beds down to bedrock, damage riparian vegetation, and eliminate the ability of riparian areas to store water and function as shallow aquifers. While harvesting timber, it is sometimes necessary to yard logs through

riparian areas; this can cause damage to riparian vegetation and stream banks.

Groundwater

Water which infiltrates the soil surface is known as groundwater. Most groundwater eventually discharges into stream channels. Groundwater is found in layers called aquifers, water bearing rocks or sediments which occur at depths from a few feet to several hundred feet below the surface. There are two types of aquifers; unconfined and confined. Unconfined aquifers are also known as water table aquifers. Unconfined aquifers are generally shallow with an impermeable layer of rock or soil defining the lower boundary and the water table (saturated zone) located between the impermeable layer and land surface. These shallow, unconfined aquifers are prone to contamination from surface pollutants. Confined aquifers (also known as artesian aquifers) are very deep below the soil surface and are separated from the surface by an impermeable layer of rock or soil. The quality of water in confined aquifers is generally excellent, however in some cases, chemicals in the subsurface geologic formations can add undesirable contaminants, such as arsenic boron or sodium.

Groundwater is replenished by rain and snow which filters through soil and geologic formations. This underground water generally moves slowly from mountains and uplands to low lands and valleys, where it is discharged to creeks, rivers, and marshes. Groundwater discharges to surface waters provide the base flow for streams throughout Oregon. This discharge may vary significantly in different areas, depending on the nature of the aquifer.

Water tables generally rise after removal of vegetation due to increased water (from reduced transpiration) recharging groundwater areas. However, reductions in groundwater may occur when subsurface flow is intercepted by road cuts and transformed into surface water through a ditch-culvert system. Some of this water is deposited on undisturbed soil areas where it returns to subsurface flow. The remainder is deposited into channels where it becomes streamflow.

Appendix Y

Oregon State Department of Environmental Quality Non-Point Source Pollution Assessment Report

Segment Number	Turb	Low-Do	Temp	Nutr	Pest	B/V	Gases	Solid	Sed	Eros	Lowflo	Debris	Struct	Plants	Other	Impairment Rating
Upper Smith River																
1	Smith River		M1						M2				S1			A1
12	Halfway Creek												M2			B
Elk Creek																
14	Umpqua River		S2								M2					A1
23	Elk Creek		S2						M2	M2	M1		M2			A1
24	Big Tom Folley Creek		M2						M2				M2			
25	Billy Creek									M2			M2			B
26	Pass Creek		S2							M2	M2		M2			A1
27	Rock Creek		S2								M2					A1
28	Sand Creek		S2													A1
372	Elk Creek	M2	S2	M2		S2			M2	M2	M1					A1
373	Elk Creek	S1	S2	M1		S1			M2	M2	M1				M1	A1
Upper Umpqua																
30	Wolf Creek		M1						M1	M2			M2			B
31	Hubbard Creek		M1						M1		M1					B
Calapooya																
32	Calapooya Creek		S2			M1			M2	M2	S1		M2			A1
33	Calapooya Creek		M2			M1			M2	M2	M1		M2			B
34	Calapooya Creek	M2	M2						M2	M2			M2			B
35	Coon Creek										S2					A1
36	Dodge Canyon Creek		M2						M2	M2	S2		M2			A1
37	Williams Creek		M2						M2	M2	S2		M2			A1
38	Pollock Creek		S2								S2					A1
39	Bachelor Creek	S2	S2								M1					B
40	Oldham Creek		S2								S2					A1

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Oregon State Department of Environmental Quality Non-Point Source Pollution Assessment Report (continued)

Segment Number	Turb	Low-Do	Temp	Nutr	Pest	B/V	Gases	Solid	Sed	Eros	Lowflo	Debris	Struct	Plants	Other	Impairment Rating
14	Umpqua River		S2								M2					A1
371	Umpqua River		S2	M1		M1					M2					A1
Rock Creek																
49	Rock Creek	M2	M2					M2	M2							B
Canton Creek																
51	Canton Creek	M2	M1						M2				S1			A2
Little River																
46	Little River	M2	M2						M2	M2	M2		M2			B
47	Fall Creek								M1							B
48	Cavitt Creek	M1	M2						M1	M2		M2	M1			B
417	Jim Creek								M2							B
Lower North Umpqua																
41	North Umpqua River		S1						M2	M2						A2
43	Sutherland Creek										S2					A1
44	Cooper Creek										S1					A1
46	Little River	M2	M2						M2	M2	M2		M2			A1
South Umpqua/Roseburg																
66	South Umpqua River	S2	S1	S1	S1	S1	M3	M2	S2		S1			S1	S1	Water Quality Limited. TMDLS Required
68	Deer Creek	S2		S2	M2	S2	M3		S2	S2	S1					
69	Deer Creek	S2							S2	S2	S1					
69	Deer Creek North Fork		S2							S2	S2	S1				
69	Deer Creek South Fork		S2							S2	S2	S1				
114	Clark Branch										S2					
115	Roberts Creek										S1					
116	Champagne Creek										S1					
370	South Umpqua River	S2	S1	M2		M1	M3	M2	M1		M1		M2	M2		
Myrtle Creek																
77	Myrtle Creek	M2	S1							M2	M1					
77	North Myrtle Creek	M2	S1							M2	M1					
78	North Myrtle Creek		M2						S2	M2	M1					
82	South Myrtle Creek	M2	S2						M2	M2	M1					
83	South Myrtle Creek		M2						M2		M1					

Oregon State Department of Environmental Quality Non-Point Source Pollution Assessment Report (continued)

Segment Number	Turb	Low-Do	Temp	Nutr	Pest	B/V	Gases	Solid	Sed	Eros	Lowflo	Debris	Struct	Plants	Other	Impairment Rating
370	South Umpqua River	S2	S1	M2	M1	M3	M2	M1		M1		M2	M2			
Olalla/Lookingglass																
70	Lookingglass Creek	S2														
71	Lookingglass Creek										S1					
72	Olalla Creek	S2														
73	Olalla Creek	M2								M2						
74	Olalla Creek										S1					A1
75	Tenmile Creek										S1					A1
76	Byron Creek										S2					A1
111	Rice Creek										S2					A1
112	Kent Creek										S2					A1
113	Willis Creek										S2					A1
402	Thompson Creek		M2		M3				M2	M2	M2					B
Cow Creek																
67	South Umpqua River		S1						M1		S1		M2			A2
91	Cow Creek	M2	M2	M3				M3								A2
99	Middle Creek	M2	M2							M2						B
108	Ash Creek										S2					A1
370	South Umpqua River	S2	S1	M2		M1	M3	M2	M1		M1		M2	M2		A2
Lower South Umpqua																
67	South Umpqua River		S1						M1		S1		M2			A2
109	Canyon Creek										M1					B
110	O'Shea Creek										M1					B
Upper South Umpqua																
67	South Umpqua River		S1						M1		S1		M2			A2
84	Days Creek	M2	S2							M2	S2			M2		A1
85	Days Creek		M2								S2					A1
86	Stouts Creek	M3	M3						M3							B
124	Deadman Creek		M1										M1			B
423	Coffee Creek	S1							S1							A1

Oregon State Department of Environmental Quality Non-Point Source Pollution Assessment Report (continued)

Segment Number	Turb	Low-Do	Temp	Nutr	Pest	B/V	Gases	Solid	Sed	Eros	Lowflo	Debris	Struct	Plants	Other	Impairment Rating
Middle Fork Coquille																
169*	MF Coquille River	M2		M2					M2	M2			M2			B
170	MF Coquille River								M2							
199	Twelve Mile Creek								M2							
200	Bridge Creek															
201	Boulder Creek															
202	Dice Creek															

- Turb Turbidity
 - Low-Do Low Dissolved Oxygen
 - Temp Elevated or Depressed Water
 - Nutr Nutrients
 - Pest Pesticides
 - Toxic Toxics
 - Salt Salt Water Intrusion
 - B/V Bacteria/Viruses
 - Radio Radioisotopes
 - Gases Dissolved Gases
 - Solid Objectionable Discoloration, Scum, Oily Slick or Film, Floating Solids
 - Sed Sedimentation
 - Eros Streambank Erosion
 - Lowflow Decreased streamflow
 - Debris Excessive Debris Accumulation
 - Struct Insufficient Stream Structure
 - Plants Excessive Plant Growths
 - Other Other (specified in comments)
 - S1 = Severe problem, data
 - S2 = Severe problem, observation
 - S3 = Severe problem, perception
 - M1 = Moderate problem, data
 - M2 = Moderate problem, observation
 - M3 = Moderate problem, perception
 - A1 = Those waterbodies in which serious non-source point pollution problems are known to exist or have been reported without challenge;
 - A2 = Those waterbodies in which moderate and/or serious non-source point pollution problems have been reported by some sources but challenged by others; and
 - B = Those waterbodies in which moderate non-source point pollution problems are known to exist or have been reported without challenge.
- *This stream segment is on Coos Bay BLM District.

Appendix Z

Wildlife Species and Primary Habitat¹ Affinities in the Roseburg District

Species	Species Status ²	Early Seral	Mid Seral	Late Seral	Mature	Old Growth	Riparian/ Wetland	Cliff/ Talus	Snags	Dead & Downed	Hardwoods
AMPHIBIANS											
Northwestern Salamander		X			X	X	X			X	
Western Long-toed Salamander		X	X	X						X	
Pacific Giant Salamander				X	X	X	X				X
Olympic Salamander					X	X	X	X			X
Clouded Salamander	A	X	X	X							
Oregon Slender Salamander	A			X		X					
Ensatina		X	X								
Dunn's Salamander				X	X	X	X	X			X
Del Norte Salamander	Cat 2			X	X	X		X			

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Wildlife Species and Primary Habitat Affinities in the Roseburg District

Wildlife Species and Primary Habitat¹ Affinities in the Roseburg District (continued)

Species	Species Status ²	Early Seral	Mid Seral	Late Seral	Mature	Old Growth	Riparian/Wetland	Cliff/Talus	Snags	Dead & Downed	Hardwoods
Western Redbacked Salamander		X	X	X	X	X	X	X		X	X
Roughskinned Newt		X	X	X	X	X	X				X
Western Toad		X	X				X			X	
Pacific Tree Frog		X	X	X	X	X	X			X	X
Tailed Frog	A	X	X	X	X	X	X			X	X
Red-legged Frog	Cat 2						X				X
Foothill Yellow-legged Frog	Cat 2						X				X
Cascade Frog	Cat 2						X				X
Bullfrog							X				
Spotted Frog	Cat 2	X					X				
REPTILES											
Western Pond Turtle	Cat 2	X	X				X			X	X
Northern Alligator Lizard		X	X							X	

Wildlife Species and Primary Habitat¹ Affinities in the Roseburg District (continued)

Species	Species Status ²	Early Seral	Mid Seral	Late Seral	Mature	Old Growth	Riparian/Wetland	Cliff/Talus	Snags	Dead & Downed	Hardwoods
Western Fence Lizard		X	X					X		X	
Western Skink		X	X				X	X		X	X
Southern Alligator Lizard		X	X							X	
Common Kingsnake	A	X					X				
California Mountain Kingsnake	A		X					X		X	
Rubber Boa		X	X							X	
Racer		X									
Sharptailed Snake	A						X	X		X	X
Pacific Ringneck Snake		X	X				X			X	X
Pacific Gopher Snake							X				X
Western Aquatic Garter Snake							X				X
Western Terrestrial Garter Snake							X			X	X
Mountain Garter Snake							X			X	X
Northwestern Garter Snake		X									

Wildlife Species and Primary Habitat Affinities in the Roseburg District

Wildlife Species and Primary Habitat¹ Affinities in the Roseburg District (continued)

Species	Species Status ²	Early Seral	Mid Seral	Late Seral	Mature	Old Growth	Riparian/Wetland	Cliff/Talus	Snags	Dead & Downed	Hardwoods
Common Garter Snake							X			X	X
Western Rattlesnake								X		X	
BIRDS											
Common Loon							X				
Pied-billed Grebe							X				
Eared Grebe							X				
Western Grebe							X				
American Bittern							X				
Great Blue Heron					X		X				X
Common Egret					X		X				X
Green Heron							X				X
Black-crowned Night Heron							X				X
Tundra Swan							X				
White-fronted Goose							X				
Snow Goose											

Wildlife Species and Primary Habitat¹ Affinities in the Roseburg District (continued)

Species	Species Status ²	Early Seral	Mid Seral	Late Seral	Mature	Old Growth	Riparian/ Wetland	Cliff/ Talus	Snags	Dead & Downed	Hardwoods
Ross Goose							X				
Canada Goose							X				
Wood Duck					X	X	X		X		X
Green-winged Teal							X				
Mallard							X				
Northern Pintail							X				
Blue-winged Teal							X				
Cinnamon Teal							X				
Northern Shoveler							X				
Gadwall							X				
American Wigeon							X				
Canvasback							X				
Redhead							X				
Ring-necked Duck							X				
Greater Scaup							X				

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Wildlife Species and Primary Habitat Affinities in the Roseburg District

Wildlife Species and Primary Habitat¹ Affinities in the Roseburg District (continued)

Species	Species Status ²	Early Seral	Mid Seral	Late Seral	Mature	Old Growth	Riparian/Wetland	Cliff/Talus	Snags	Dead & Downed	Hardwoods
Lesser Scaup							X				
Harlequin Duck	Cat 2			X	X	X	X				
Common Goldeneye							X				
Bufflehead					X	X	X		X		X
Hooded Merganser					X	X	X		X		X
Common Merganser					X	X	X		X		X
Red-breasted Merganser							X				
Ruddy Duck							X				
Turkey Vulture		X						X		X	X
Osprey							X		X		X
White-tailed Kite							X				X
Bald Eagle	T					X	X		X		
Northern Harrier							X				
Sharp-shinned Hawk				X	X	X					

Wildlife Species and Primary Habitat¹ Affinities in the Roseburg District (continued)

Species	Species Status ²	Early Seral	Mid Seral	Late Seral	Mature	Old Growth	Riparian/Wetland	Cliff/Talus	Snags	Dead & Downed	Hardwoods
Cooper's Hawk				X	X	X					X
Northern Goshawk	Cat 2				X	X					
Red-tailed Hawk		X				X					X
Rough-legged Hawk						X					
Golden Eagle		X				X					
American Kestrel		X							X		X
Merlin							X				
Prairie Falcon		X						X			X
Peregrine Falcon	E							X			
Ring-necked Pheasant							X				
Blue Grouse		X	X	X	X	X				X	
Ruffed Grouse							X			X	X
California Quail		X									
Mountain Quail	Cat 2	X									

Appendices 185

Wildlife Species and Primary Habitat Affinities in the Roseburg District

Wildlife Species and Primary Habitat¹ Affinities in the Roseburg District (continued)

Species	Species Status ²	Early Seral	Mid Seral	Late Seral	Mature	Old Growth	Riparian/ Wetland	Cliff/ Talus	Snags	Dead & Downed	Hardwoods
Virginia Rail							X				
Sora							X				
American Coot							X				
Semipalmated Plover											
Killdeer							X				
Greater Yellowlegs							X				
Lesser Yellowlegs							X				
Spotted Sandpiper							X				
Western Sandpiper							X				
Least Sandpiper							X				
Dunlin							X				
Short-billed Dowitcher							X				
Long-billed Dowitcher							X				
Common Snipe							X				

Wildlife Species and Primary Habitat¹ Affinities in the Roseburg District (continued)

Species	Species Status ²	Early Seral	Mid Seral	Late Seral	Mature	Old Growth	Riparian/Wetland	Cliff/Talus	Snags	Dead & Downed	Hardwoods
Northern Phalarope											
Ring-billed Gull							X				
California Gull							X				
Herring Gull							X				
Western Gull								X			
Glaucous-winged Gull								X			
Marbled Murrelet	T					X					
Rock Dove								X			
Band-tailed Pigeon						X	X				X
Mourning Dove							X				X
Common Barn-owl		X					X		X		
Western Screech-owl							X		X		X
Great Horned Owl		X			X	X	X				X

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Wildlife Species and Primary Habitat Affinities in the Roseburg District

Wildlife Species and Primary Habitat¹ Affinities in the Roseburg District (continued)

Species	Species Status ²	Early Seral	Mid Seral	Late Seral	Mature	Old Growth	Riparian/Wetland	Cliff/Talus	Snags	Dead & Downed	Hardwoods
Northern Pygmy-owl					X	X			X		
Great Gray Owl	A	X			X	X					
Northern Spotted Owl	T					X					
Barred Owl					X	X			X		X
Snowy Owl		X					X				X
Short-eared Owl							X				
Flammulated Owl	A				X	X			X		
Northern Saw-whet Owl	A	X			X	X			X		X
Common Nighthawk		X					X	X			
Vaux's Swift		X	X			X	X		X		X
Anna's Hummingbird							X				X
Rufous Hummingbird		X	X		X		X				X
Belted Kingfisher							X	X	X		X

Wildlife Species and Primary Habitat¹ Affinities in the Roseburg District (continued)

Species	Species Status ²	Early Seral	Mid Seral	Late Seral	Mature	Old Growth	Riparian/ Wetland	Cliff/ Talus	Snags	Dead & Downed	Hardwoods
Lewis' Woodpecker	A								X		
Acorn Woodpecker									X		
Yellow-bellied Sapsucker							X		X		X
Downy Woodpecker							X		X		X
Hairy Woodpecker					X	X			X		
Black-backed Woodpecker	A								X		
Three-toed Woodpecker	A				X	X			X		
Northern Flicker		X			X	X			X		X
Pileated Woodpecker	A					X			X		
Olive-sided Flycatcher					X	X					
Western Wood-Pewee			X		X	X					X
Traill's Flycatcher (Willow or Alder)							X				

Wildlife Species and Primary Habitat Affinities in the Roseburg District

Appendices 189

Wildlife Species and Primary Habitat¹ Affinities in the Roseburg District (continued)

Species	Species Status ²	Early Seral	Mid Seral	Late Seral	Mature	Old Growth	Riparian/Wetland	Cliff/Talus	Snags	Dead & Downed	Hardwoods
Hammond's Flycatcher					X	X					
Western Kingbird							X				
Purple Martin	A						X		X		X
Tree Swallow		X				X	X		X		X
Violet-green Swallow							X	X	X		X
Western flycatcher						X	X				
Dusky flycatcher		X	X								
Ash-throated flycatcher							X				
Northern Rough-winged Swallow							X	X			
Bank Swallow							X	X			
Cliff Swallow							X	X			
Barn Swallow							X				
Gray Jay			X	X	X	X	X				
Steller's Jay			X	X	X	X	X				

Wildlife Species and Primary Habitat¹ Affinities in the Roseburg District (continued)

Species	Species Status ²	Early Seral	Mid Seral	Late Seral	Mature	Old Growth	Riparian/Wetland	Cliff/Talus	Snags	Dead & Downed	Hardwoods
Scrub Jay		X	X								
American Crow							X				X
Common Raven		X	X		X	X		X			X
Black-capped Chickadee							X		X		X
Chestnut-backed Chickadee			X	X	X	X	X		X		
Mountain chickadee				X	X			X			
Bushtit		X	X								
Red-breasted Nuthatch					X	X	X		X		
White-breasted Nuthatch							X		X		X
Brown Creeper					X	X	X		X		
Bewick's Wren							X			X	X
House Wren							X		X	X	X
Winter Wren					X	X				X	X

Wildlife Species and Primary Habitat Affinities in the Roseburg District

Wildlife Species and Primary Habitat¹ Affinities in the Roseburg District (continued)

Species	Species Status ²	Early Seral	Mid Seral	Late Seral	Mature	Old Growth	Riparian/Wetland	Cliff/Talus	Snags	Dead & Downed	Hardwoods
Long-billed											
Marsh Wren							X				
American Dipper							X				
Golden-crowned Kinglet				X	X	X					X
Ruby-crowned Kinglet		X	X		X	X					X
Western Bluebird	A						X		X		X
Townsend's Solitaire		X	X		X	X		X		X	X
Swainson's Thrush		X	X	X	X	X	X				X
Hermit Thrush		X	X		X	X	X				X
American Robin		X	X	X			X				X
Varied Thrush					X	X					
Wrentit											X
Water Pipit							X				

Wildlife Species and Primary Habitat¹ Affinities in the Roseburg District (continued)

Species	Species Status ²	Early Seral	Mid Seral	Late Seral	Mature	Old Growth	Riparian/ Wetland	Cliff/ Talus	Snags	Dead & Downed	Hardwoods
Bohemian waxwing							X				X
Cedar Waxwing							X				X
Northern Shrike							X				
European Starling							X		X		X
Solitary Vireo					X	X					
Hutton's Vireo							X				X
Warbling Vireo							X				X
Orange-crowned Warbler		X	X				X				X
Nashville Warbler											X
Yellow Warbler							X				X
Yellow-rumped Warbler		X	X	X	X	X					X
Black-throated Gray Warbler		X	X	X	X	X	X			X	

Wildlife Species and Primary Habitat Affinities in the Roseburg District

Wildlife Species and Primary Habitat¹ Affinities in the Roseburg District (continued)

Species	Species Status ²	Early Seral	Mid Seral	Late Seral	Mature	Old Growth	Riparian/Wetland	Cliff/Talus	Snags	Dead & Downed	Hardwoods
Townsend's Warbler					X	X					
Hermit Warbler				X	X	X	X				
MacGillivray's Warbler							X			X	
Common Yellowthroat						X					
Yellow-breasted chat							X				
Wilson's Warbler							X			X	
House Sparrow		X									
Western Tanager		X			X	X					
Black-headed Grosbeak							X			X	
Lazuli Bunting							X			X	
Rufous-sided Towhee		X	X				X			X	
Chipping Sparrow		X	X				X			X	
Vesper Sparrow										X	

Wildlife Species and Primary Habitat¹ Affinities in the Roseburg District (continued)

Species	Species Status ²	Early Seral	Mid Seral	Late Seral	Mature	Old Growth	Riparian/ Wetland	Cliff/ Talus	Snags	Dead & Downed	Hardwoods
Savannah Sparrow							X				
Fox Sparrow							X				X
Song Sparrow							X				X
Lincoln Sparrow							X				
Golden-crowned Sparrow							X				
White-crowned Sparrow		X					X				X
Dark-eyed Junco		X	X		X	X					X
Red-winged Blackbird							X				
Western Meadowlark	A										
Yellow-headed Blackbird							X				
Brewer's Blackbird		X					X				X
Brown-headed Cowbird		X	X				X				X

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Wildlife Species and Primary Habitat Affinities in the Roseburg District

Wildlife Species and Primary Habitat¹ Affinities in the Roseburg District (continued)

Species	Species Status ²	Early Seral	Mid Seral	Late Seral	Mature	Old Growth	Riparian/Wetland	Cliff/Talus	Snags	Dead & Downed	Hardwoods
Northern Oriole							X				X
Purple Finch			X		X	X					X
House Finch											
Red Crossbill					X	X					
Pine Siskin		X	X	X	X	X	X				X
Lesser Goldfinch							X				X
American Goldfinch							X				X
Evening Grosbeak		X	X	X	X						
MAMMALS											
Virginia Opossum							X		X	X	X
Pacific Water Shrew							X			X	X
Dusky Shrew				X	X	X	X			X	X
Pacific Shrew		X					X			X	
Water Shrew							X			X	X

Wildlife Species and Primary Habitat¹ Affinities in the Roseburg District (continued)

Species	Species Status ²	Early Seral	Mid Seral	Late Seral	Mature	Old Growth	Riparian/Wetland	Cliff/Talus	Snags	Dead & Downed	Hardwoods
Trowbridge's Shrew				X	X	X	X			X	X
Vagrant Shrew		X					X				
Shrew-mole				X	X		X			X	X
Coast Mole		X	X								
Townsend's Mole		X									
Pallid Bat	A	X					x				
Big Brown Bat		X				X	X	X	X		X
Silver-haired Bat			X	X	X	X			X		X
Hoary Bat		X	X		X	X	X				X
California Myotis		X	X	X	X	X	X	X	X		X
Long-eared Myotis					X	X	X		X		X
Little Brown Myotis		X		X	X	X	X	X	X		X
Fringed myotis	BS	X					X	X			

Wildlife Species and Primary Habitat Affinities in the Roseburg District

Wildlife Species and Primary Habitat¹ Affinities in the Roseburg District (continued)

Species	Species Status ²	Early Seral	Mid Seral	Late Seral	Mature	Old Growth	Riparian/Wetland	Cliff/Talus	Snags	Dead & Downed	Hardwoods
Brazilian free-tailed bat							X				
Long-legged Myotis		X	X		X	X	X		X		X
Yuma Myotis		X			X	X	X	X	X		X
Pacific Big-eared Bat	Cat 2		X				X	X			X
Coyote		X	X				X	X		X	
Gray Fox										X	
Red Fox		X					X			X	
Black Bear		X	X	X	X	X	X			X	
Raccoon		X	X	X	X	X	X		X	X	X
Ring Tail		X	X					X			
River Otter							X				X
Marten	A				X	X			X	X	
Fisher	Cat 2				X	X		X	X	X	
Striped Skunk							X				
Ermine		X		X	X	X				X	
Long-tailed Weasel		X	X							X	

Wildlife Species and Primary Habitat¹ Affinities in the Roseburg District (continued)

Species	Species Status ²	Early Seral	Mid Seral	Late Seral	Mature	Old Growth	Riparian/ Wetland	Cliff/ Talus	Snags	Dead & Downed	Hardwoods
Mink							X			X	X
Spotted Skunk		X	X				X	X		X	X
Mountain Lion		X	X		X		X	X			
Bobcat		X	X				X	X		X	X
Roosevelt Elk		X	X	X	X	X	X				X
Black-tailed Deer		X	X	X	X						X
Columbian White-tailed Deer	E						X				
Mountain Beaver		X	X							X	
Northern Flying Squirrel					X	X			X		
Western Gray Squirrel									X		
California Ground Squirrel		X									
Townsend's Chipmunk			X	X	X	X			X	X	

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Wildlife Species and Primary Habitat Affinities in the Roseburg District

Wildlife Species and Primary Habitat¹ Affinities in the Roseburg District (continued)

Species	Species Status ²	Early Seral	Mid Seral	Late Seral	Mature	Old Growth	Riparian/Wetland	Cliff/Talus	Snags	Dead & Downed	Hardwoods
Douglas Squirrel			X	X	X	X			X		
Botta's Pocket Gopher		X									
Western Pocket Gopher		X									
Beaver							X				X
Bushy-tailed Woodrat				X	X	X		X		X	
Dusky-footed Woodrat		X	X	X	X	X					X
Deer Mouse		X	X						X		X
White-footed Vole	Cat 2				X	X	X				X
Red Tree Vole				X	X	X					
Western Red-backed Vole				X	X	X					X
California Vole		X									X
Long-tailed Vole		X	X				X				
Creeping Vole		X	X				X			X	X

Wildlife Species and Primary Habitat¹ Affinities in the Roseburg District (continued)

Species	Species Status ²	Early Seral	Mid Seral	Late Seral	Mature	Old Growth	Riparian/Wetland	Cliff/Talus	Snags	Dead & Downed	Hardwoods
Townsend's Vole		X					X				
Muskrat							X				
House Mouse											
Norway Rat											
Pacific Jumping Mouse		X					X				
Porcupine		X	X	X	X	X		X		X	
Nutria							X				
Pika							X				
Snowshoe Hare		X									
Black-tailed Jackrabbit											
Brush Rabbit		X	X		X						X

¹Primary habitat is breeding, feeding, or resting habitat within the respective seral stages and unique habitats (after Brown 1985).

²Status: Federally Endangered (E); Federally Threatened (T); Federally Proposed (P); Federal Candidate Category 1 (CAT1); Category 2 (CAT2); Bureau Sensitive (BS); Assessment Species (A).

Appendix AA

Fish Species in Roseburg District Area Streams

Nonsalmonid

Western brook lamprey
Pacific lamprey
White sturgeon
American shad
Olympic mudminnow
Umqua chub
Peamouth
Umpqua Squawfish
Dace *Rhinichthys spp.*
Redside Shiners
Suckers *Catostomus spp.*
Brown Bullheads
Channel catfish
Mosquito fish
Threespine stickleback
Striped bass
Sunfishes *Lepomis spp.*
Smallmouth bass
Largemouth bass
White crappie
Black crappie
Yellow perch
Sculpins *Cottus spp.*

*Priority species
Source: Brown 1985

Salmonid

Chum salmon*
Coho salmon
Sockeye salmon
Chinook salmon*
Cutthroat trout*
Steelhead (rainbow trout)*
Brown trout

Appendix BB

Forest Inventory

Before alternative land use plans can be properly developed and considered for forested public lands, information about the land must be available. Some of the most important information is related to the acreage of land suitable for tree growth, the ability of the land to grow trees, the location and condition of the trees and the growth rate and present volume of the trees. The BLM obtains this information primarily through three inventory systems.

Timber Production Capability Classification (TPCC)

The Timber Production Capability Classification (TPCC) is an intensive inventory process initiated in 1972 to categorize all public land administered by BLM in western Oregon based upon the land's physical and biological capacity to produce timber. TPCC was conducted in accordance with Oregon Manual Supplement 5250.

The 1977 TPCC identified commercial forest land which could be managed on a sustained yield basis. This land formed the potential timber production base for computation of the annual allowable harvest. Approximately 390,000 acres were identified in this category. The TPCC also identified about 11,000 acres of commercial forest land that was determined to be incapable of under-going harvest without significant site degradation. This land was left out of the potential timber production base. Sites were placed in this category only when it was judged that economically reasonable technology was not available to mitigate such degradation. The remainder of the district's 424,000 acres was classified as non-forest or non-commercial forest.

In 1977 the TPCC partitioned land within the district into major classes indicating relative suitability to produce timber on a sustained yield basis. The five major classes were high intensity management, limited management, withdrawn, non-forest, and non-commercial forest lands.

High Intensity Management Lands

High intensity managed lands are commercial forest lands that could be managed without undue loss of site productivity and be adequately reforested within specified time limits following regeneration cuts. These lands form the base acreage used to compute the annual sale quantity.

The classification contains two major sub-classes: non-problem sites and restricted sites.

Non-problem sites are commercial forest lands that could be managed by clearcut or partial cut with expectations of adequate regeneration within five years of the regeneration cut using standard reforestation techniques.

Restricted sites are commercial forest lands on which management is limited for timber production. This classification contains three sub-classes: fragile-restricted, both fragile and reforestation-restricted, and reforestation restricted.

Limited Management (Final Harvest Only)

Some regenerated stands in the district are not stocked to the minimum trees per acre specified in reforestation goals. These are identified as limited management only since costs for intensive management practices such as precommercial thinning and fertilization would exceed benefits. Also, growth gains from intensive management practices would not accrue in these understocked stands.

Withdrawn

These are commercial forest lands which, because of their severe physical and biological limitations are not capable of receiving management for wood fiber production without causing site productivity losses and/or result in understocked conditions after five years, and stocked unestablished in 15 years.

These lands are withdrawn from timber production base and are not considered for Allowable Sale Quantity (ASQ) computations. In the case of catastrophe, these sites would be reanalyzed to determine what course of action should be taken to best serve the total resource value.

Also included is an Adverse Location classification which is defined as: sites difficult or impossible to manage because of their physical isolation.

NonForest Land

Nonforest lands are areas within the forest zone that are not capable of being at least 10 percent stocked with forest trees, and those lands which were converted to non-forest uses. Examples of nonforest lands are: roads, powerline rights-of-way, rock outcrops, rivers and lakes.

Non-commercial Forest Land

Non-commercial forest lands are lands which are not capable of yielding at least 20 cubic feet of wood per acre per year of commercial species. This classification is divided into two subclassifications: sites not capable of yielding at least 20 cubic feet per acre per year of a commercial species; or sites on which only noncommercial tree species are capable of growing. Noncommercial species includes all hardwoods, salable or nonsalable. If the site contains noncommercial species but is capable of producing more than 20 cubic feet per acre of a commercial coniferous species it is considered to be commercial forest land.

The 1988 TPCC introduced a woodland classification, which is divided into suitable or nonsuitable woodlands. Two categories of Commercial Forest Land (CFL) were also established.

CATEGORY I CFL - Sites that can be reforested within five years of harvest using: 1) artificial regeneration and operational reforestation practices; OR 2) natural regeneration in the pine and true fir forest types. A reforested site meets all stocking level standards, seedling criteria, and management goals described in BLM Manual 5705 "Regeneration Stocking Survey". These sites can have a non-problem, fragile, reforestation, or dual (fragile and reforestation) classification.

CATEGORY II CFL - Sites that can be reforested within six to fifteen years of harvest using natural

and/or artificial regeneration in all forest types. These sites can have fragile, reforestation, or dual (fragile and reforestation) classifications.

Significant Differences

The 1988 TPCC does not have Limited Management, Adverse Location or Statutory Withdrawal classifications. These lands were reclassified, with the majority being included in the Non-suitable Woodland, Suitable Woodland or Category II CFL classifications.

There are two major differences concerning stocking criteria and silvicultural prescriptions:

Adequately Stocked Criteria

For the 1977 TPCC, all lands classified as CFL would meet the stocking criteria shown below. Stocking is expressed as the minimum number of well-spaced trees per acre (T/A) desired at the time of first intermediate harvest (age 30-50) on an area. The target stocking varies by site productivity class.

Site II	Site III	Site IV	Site V
320 T/A	280 T/A	245 T/A	200 T/A

For the 1988 TPCC, all lands classified as CFL would meet the stocking criteria shown below:

Site II	Site III	Site IV	Site V
150 T/A	150 T/A	150 T/A	100 T/A

As in 1977, stocking is expressed as a minimum number of well spaced trees per acre desired by site class. However, the 1988 standard reflects the desired number of trees per acre at final harvest age (70-80 years).

The change in number of well spaced trees required reflects changes in BLM stocking requirements. The standard used for the 1988 TPCC reflects the fact that biological, environmental, economic, or other factors may preclude achievement of higher stocking on some sites.

The current standard is based on the estimated number of trees per acre needed to fully utilize the sites productivity potential at rotation age. It precludes intermediate harvests but requires sufficient trees per acre for full final harvest volumes.

Standard Silvicultural Operation

Under 1977 guidelines, land was classified Non-problem from a silvicultural standpoint if it could be stocked to the level indicated utilizing "normal silvicultural practices." These practices were defined as those things that would "normally" be done to the land to achieve the desired stocking level. These included planting, prescribed fire, control of competing vegetation, and animal damage control.

Under 1988 guidelines, land was classified Non-problem from a silvicultural standpoint if it could be stocked to the level indicated utilizing "Standard silvicultural practices." These practices were defined as "one planting and one site preparation treatment". Any further action resulted in a restricted classification.

Because of the above differences, a large portion of the CFL was classified as Non-problem in the 1977 TPCC, while the 1988 TPCC has very little land classified as Non-problem.

The TPCC Handbook is available for inspection during normal working hours at the District Office, and provides a complete description of the classifications.

Operations Inventory

For BLM to carry out the timber management program effectively, specific information as to the location and current condition of the various forest types within the land base must be available to the managers. This is accomplished through the Operations Inventory (OI) in accordance with procedures contained in the Operations Inventory Handbook.

The OI is an intensive inventory which divides the forests into survey units sufficiently uniform in composition, condition, operability, productivity, or other characteristics to distinguish them from adjacent units. Information on each unit is maintained in the MICRO*STORMS computer system. Each survey unit has information on location, acreage, stand condition, past management, silvicultural needs and opportunities for application of intensive management practices.

Forest Reinventory Extensive Inventory (5-point)

The purpose of the extensive inventory is to determine the existing volume in the district. A reinventory of commercial forest land was completed in 1988 employing procedures jointly developed by the USFS and BLM. The reinventory used the same basic inventory design used for preparation of the present management plan. The inventory is a stratified random sample of the commercial forest land base. Each plot is a cluster of five sample points. Each point is the center of both a fixed and variable radius plot.

The objective of the inventory is to measure various characteristics, tree growth, tree condition and to estimate the total coniferous volume within plus or minus ten percent (two standard deviations). Statistical analysis indicates that the total conifer volume estimates for merchantable strata on the district is within 8.45 percent for the Douglas Master Unit, based on measurements of 290 plots and 9.59 percent for the South Umpqua Master Unit, based on measurements of an additional 218 plots.

Inventory plots are stratified based on site index, age and major TPCC type (Suitable Commercial Forest Land, Suitable Woodland, Non-Suitable Woodland and Non-forest and Recreation sites).

Table BB-1. Stratification of Inventory Plots by SYU

Douglas Sustained Yield Unit

Strata		No. Plots	GIS Acreage	Strata Sampling Error* (90% CL)
10/15	Non-stocked	8	15,130	
11/16	Premench	119	100,366	19.88
12/17	Young Merch	44	36,115	11.76
13/18	Mature	66	58,586	9.82
14/19	Old-growth	39	72,770	11.33
40/50	Suitable Woodland	2	422	
41/51	Non-suitable Woodland	2	6,153	
60/70	Non-forest/Rec	10	1,900	
	Total	290	291,442	

Percent Sampling Error* = 8.45%

South Umpqua Sustained Yield Unit

Strata		No. Plots	GIS Acreage	Strata Sampling Error* (90% CL)
10/15	Non-stocked	9	6,486	
11/16	Premench	69	30,485	26.42
12/17	Young Merch	29	9,741	17.22
13/18	Mature	39	18,405	12.20
14/19	Old-growth	57	34,088	11.19
40/50	Suitable Woodland	1	484	
41/51	Non-suitable Woodland	3	3,627	
60	Non-forest/Rec	11	1,235	
	Total	218	104,551	

Percent Sampling Error* = 9.59%

*All sampling errors computed using live and dead cubic volume estimates for both firm and chip material.

Appendix CC

Beneficial Uses by Analytical Watershed

Beneficial Use	Upper Smith River	Elk Creek	Calapooya	Upper Umpqua	Lower North Umpqua	Little River	Rock Creek	Canton Creek	South Umpqua/Roseburg
Public Domestic Water Supply		X	X	X	X	X	X	X	X
Private Domestic Water Supply	X	X	X	X	X	X	X	X	X
Industrial Water Supply	X	X	X	X	X	X	X	X	X
Irrigation	X	X	X	X	X	X	X	X	X
Livestock Watering	X	X	X	X	X	X	X	X	X
Anadromous Fish Passage	X	X	X	X	X	X	X	X	X
Salmonid Fish Rearing	X	X	X	X	X	X	X	X	X
Salmonid Fish Spawning	X	X	X	X	X	X	X	X	X
Resident Fish & Aquatic Life	X	X	X	X	X	X	X	X	X
Wildlife and Hunting	X	X	X	X	X	X	X	X	X
Fishing	X	X	X	X	X	X	X	X	X
Boating	X	X	X	X	X	X			X
Water Contact Recreation	X	X	X	X	X	X	X	X	X
Aesthetic Quality	X	X	X	X	X	X	X	X	X
Hydro Power					X	X	X	X	X
Commercial Navigation									

Appendix DD

Analytical Assumptions About Global Climate Change

Many scientists have predicted significant global warming within the next sixty years, due to increasing levels of carbon dioxide and other gases in the atmosphere. Others have further hypothesized a climate change in western Oregon that would make it difficult or impossible to maintain, without change, the current ecosystems, including the major forest tree species. Among the relevant uncertainties, it is expected that warmer, drier weather would increase the incidence of wildfire, but warmer, wetter weather might reduce it. Rapid change may make the forest more susceptible to insect and disease attack because generational succession occurs much more quickly among pests than among trees. Other possible effects include raising soil temperatures and lengthening summer droughts. This could shift the range of Douglas-fir forest toward higher elevations, reduce the range for current high-elevation species, and increase the range for dryland species such as lodgepole and ponderosa pine. Thus, management practices, particularly stand establishment and manipulation, could be affected. Assuring adequate tree regeneration would probably be the most serious management problem in areas that become marginal. (Greenhouse Gases, Climate Change and U.S. Forest Markets - James L. Regens, Frederick W. Cabbage and Donald G. Hodges - Environment, May 1989, 31:4).

There is, however, no scientific consensus about the expected extent or rate of global warming or the probable effect on forest ecosystems in western Oregon. Neither the environmental record nor the limited capabilities of the climate models permit a reliable forecast of climate changes. (Policy Implications of Greenhouse Warming - National Academy of Sciences, 1991). Furthermore, available models show marked differences in their predictions of change in western Oregon. (Climate Change and America's Forests - Linda A. Joyce, Michael A. Fosberg, and Joan M. Comanor - USDA Forest

Service, General Technical Report RM-187, 1990). In addition, the most commonly predicted temperature changes are not expected to affect woody biomass production or the dominance of Douglas-fir in the region, although they could alter codominant species composition in older forests. (Potential Effects of Climate Change on Stand Development in the Pacific Northwest - V.H. Dale and J.F. Franklin - Canadian Journal of Forest Research, 19(12), 1989). At the high end of the range of predicted changes, however, are temperature increases that could be great enough, by around the middle of the 21st century, to inadequately meet the winter "chilling requirement" for Douglas-fir to start growth again in the spring. (Predicted Global Climate Change and the Chilling Requirement of Conifers - D.P. Lavender. Paper presented at Western Forestry Conference, Sacramento, California, 1989).

The increasing carbon dioxide levels are generally thought to be beneficial to plant growth, but available information does not suggest which forest tree species may be most responsive to that increase or how their responsiveness may also be affected by any changes in climate or by fertilization in managed forests.

Although climate change may occur and may, in a number of decades, affect the species composition of the forest, it is not considered likely to affect forestry practices during the ten-year life of the plan. Nonetheless, the draft plan incorporates a process of adaptive management (see Chapter 2, Management Direction Common to All Alternatives, Use of the Plan) permitting effective response to changing knowledge. Thus, should a scientific consensus emerge during the life of the plan, indicating that forestry practices should be modified promptly in anticipation of the effects of global warming, BLM will be able to adjust.

Appendix EE

Ten Year Mineral Development Scenarios

Introduction

This appendix describes the Reasonably Foreseeable Development (RFD) scenarios for development of leasable, locatable and salable mineral commodities. The purpose of the RFDs is to provide models that anticipate the level and type of future mineral activity in the planning area. These scenarios and known impacts from past activity will serve as a basis for cumulative impacts analysis. The RFD first describes the steps involved in developing a mineral deposit, with presentation of hypothetical exploration and mining operations. The current activity levels are discussed in Chapter 3 of this document. Future trends and assumptions affecting mineral activity are discussed here, followed by the prediction of the surface impacts of the anticipated mineral exploration and development.

Scope

The development scenario is limited in scope to BLM-administered lands in the planning area. The RFD is based on the known or inferred mineral resource capabilities of the lands involved, and applies the conditions and assumptions discussed under Future Trends and Assumptions. Changes in available geologic data and/or economic conditions would alter the RFD, and some deviation is to be expected over time.

Leasable Minerals

Reasonably Foreseeable Development of Oil and Gas Resources (Common to All Alternatives)

Future Trends and Assumptions

Based on the history of past drilling and foreseeable development potential in the operating area, activity over the next decade will continue to be sporadic. It is not anticipated that there will be a discovery of producible oil or gas fields in the Roseburg District

during the plan period. However, to comply with the Supplemental Program Guidance for Fluid Minerals (Manual Section 1624.2), the potential surface impacts associated with the discovery and development of a small gas field are outlined below. It is anticipated that oil and gas activity will consist of the issuance of some competitive and over the counter leases, a few geophysical surveys, and perhaps the drilling of three exploratory wells.

The supply of natural gas in the region has been plentiful and is forecasted to remain that way in the future. The price of natural gas has gone down recently and it is predicted that future prices may stay at or close to the current price. Recent economic conditions within the oil industry resulted in a decline in the number of active exploratory wells being drilled in other parts of the nation. Continued low prices and depressed economic conditions would result in a nationwide decrease in domestic exploration and development. A turnaround in the oil industry or, an increase in the price of oil and gas purchased from other countries, would spur an increase in demand for domestic production, increasing the number of wells drilled.

Development of Oil and Gas Resources

Geophysical Explorations

Geophysical exploration is conducted to try to determine the subsurface structure of an area. Three geophysical survey techniques are generally used to define subsurface characteristics through measurements of the gravitational field, magnetic field, and seismic reflections.

Gravity and magnetic field surveys involve small portable measuring units which are easily transported via light off-road vehicles, such as four-wheel drive vehicles, or aircraft. Both off-road and on-road travel may be necessary in these two types of surveys. Usually a three-man crew transported by one or two vehicles is required. Sometimes small holes (approximately one inch by two inches by two inches) are hand dug for instrument placement at the survey

measurement points. These two survey methods can make measurements along defined lines, but it is more common to have a grid of discrete measurement stations.

Seismic reflection surveys are the most common of the geophysical methods, and they produce the most detailed subsurface information. Seismic surveys are conducted by sending shock waves, generated by a small explosion or through mechanically beating the ground surface with a thumping or vibrating platform, through the earth's surface. The thumper and vibrator methods pound or vibrate the ground surface to create a shock wave. Usually four large trucks are used, each equipped with pads about four foot square. The pads are lowered to the ground, and the vibrators are electronically triggered from the recording truck. Once information is recorded, the trucks move forward a short distance and the process is repeated. Less than 50 square feet of surface area is required to operate the equipment at each recording site.

The small explosive method requires that charges be detonated on the surface or in a drill hole. Holes for the charges are drilled utilizing truck-mounted or air portable drills to drill small-diameter (two to six inches) holes to depths of 100-200 feet. Generally four to 12 holes are drilled per mile of line and a five to 50-pound charge of explosives is placed in the hole, covered, and detonated. The created shock wave is recorded by geophones placed in a linear fashion on the surface. In rugged terrain, a portable drill carried by helicopter can sometimes be used. A typical drilling seismic operation may utilize 10-15 men operating five to seven trucks. Under normal conditions, three to five miles of line can be surveyed daily using this method. The vehicles used for a drilling program may include heavy truck-mounted drill rigs, track-mounted air rigs, water trucks, a computer recording truck, and several light pickups for the surveyors, shot hole crew, geophone crew, permit expert, and party chief.

Public and private roads and trails are used where possible. However, off-road cross-country travel is also necessary in some cases. Graders and dozers may be required to provide access to remote areas. Several trips a day are made along a seismograph line, usually resulting in a well defined two track trail. Drilling water, when needed, is usually obtained from private landowners.

A Notice of Intent authorizes geophysical exploration when there is no mineral lease on the tract. It is anticipated that one Notice of Intent, involving

seismic reflection surveys will be filed during the life of this plan.

The surface charge method utilizes one to five pound charges attached to wooden laths three to eight feet above the ground. Placing the charges lower than six feet usually results in the destruction of vegetation, while placing the charges higher, or on the surface of deep snow, results in little visible surface disturbance.

Surface Impacts of Geophysical Explorations

It is anticipated that the foreseeable geophysical explorations for oil and gas on the Roseburg District will consist of seismic reflection surveys, utilizing approximately ten miles of existing roads. Surface impacts will involve temporary blockage of the roads by the four large trucks used to gather the data with a vibrating platform, but no damage to the roads is expected using this type of equipment.

The small explosive method is also anticipated to be used on an additional ten miles of line. Surface disturbance for this type of geophysical exploration is expected to consist of drilling four holes per mile of line, totalling 40 drill holes. Each drill hole will impact about 200 square feet, but 36 of these holes will be drilled on existing landings, spur roads, or timber haul roads. Therefore, 7,200 square feet (approx. 0.2 acre) of existing road surface will temporarily be impacted by drilling activities and low power blasting. Blasting will not be powerful enough to impact any surface resources or improvements. It is anticipated that four drill holes will be made on areas currently undeveloped. The drill pads will impact approximately 200 square feet each with short spur roads (100 feet long and 25 feet wide) constructed to each drill hole location. Surface disturbance of these four drill holes would affect approximately 0.25 acres. The total surface disturbance using the drilling, blasting method is expected to impact 0.5 acre.

Drilling Phase

One Notice of Staking is anticipated during the plan period. It is anticipated that the company would then also submit an Application to Drill (APD) after the Notice of Staking is accepted. Private surface owner input will be actively solicited during this stage. Once the APD is approved, the operator may begin construction activities in accordance with stipulations and conditions. When a site is chosen that necessitates the construction of an access road, the

length of road may vary, but usually the shortest feasible route is selected to reduce the haul distance and construction costs. Environmental factors or a landowner's wishes may dictate a longer route in some cases. Drilling activity in the planning area is predicted to be done using existing roads and constructing short (approximately one-quarter mile) roads to access each drill site location.

Based on past oil and gas drilling in Oregon and for analysis purposes, it is projected that three exploratory "wildcat" wells will be drilled on BLM-administered land in the planning area. The estimated success rate of finding hydrocarbons is predicted to be no greater than ten percent, based on the average U.S. wildcat well success rate. Drilling is expected to be in an area of "high" oil and gas potential which is the highest level of potential for oil and gas on this District. There is approximately a one in 50 chance of new field discovery during the life of the plan, with a strong likelihood that any such discovery would be natural gas, since current western Oregon production to date has been natural gas.

Surface Impacts of Drilling

During the first phase of drilling, the operator will move construction equipment over existing maintained roads to the point where the new access road begins. No more than a quarter of a mile of moderate duty access road per well site is anticipated to be constructed. The surface disturbance for new road building will average 40 feet wide with ditches, cuts and fills for a quarter of a mile in length, therefore the acreage impacted by road building will approximately 1.25 acres for each well. For the three anticipated wells, a total of 3.75 acres would be needed for new road construction.

The second part of the drilling phase is the construction of the drilling pad or platform, anticipated to involve approximately two acres per well site. Support facilities are anticipated to disturb about two acres per well site. The likely duration of well development, testing, and abandonment is predicted to be approximately six months for each drill site. Therefore, the total disturbance for the three exploratory wells, support services, and new road construction is expected to be no more than a total of approximately 12 acres.

Producing Phase

One gas field of 50 - 60 Bcf could be discovered on BLM-administered lands at a depth of 2,000 to 3,000

feet during the plan period. It is estimated that the productive life span of this field would be about ten years. The size of the field would be approximately 200 acres and the well spacing would be about 160 acres (one well per quarter section). It is anticipated that the field would require four development wells in addition to the discovery well. All gas production would be carried by pipelines for a distance of approximately 40 miles. All well service requirements would be provided by established service companies.

Surface Impacts of Field Development and Production

Each development well pad would be approximately two acres in size and, as a result, a total of eight acres would be involved in drill pad construction. New roads leading to each of these drill pads would have to be constructed and it is estimated that each of the new roads would be about 1/4 mile in length with a right-of-way width of 40 feet. Therefore, approximately 1.25 acres would be involved for each newly constructed road, and the total surface disturbance attributed to new road construction would be five acres. A pipeline 40 miles long with a right-of-way of 30 feet would disturb about 145 acres. Due to the checkerboard public land ownership in this area, it is estimated that only about one-half of that acreage would be on public lands administered by the BLM. Therefore, it is estimated that about 73 acres would be impacted from pipeline construction.

The total surface disturbance of field development and production would be approximately 86 acres.

Plugging and Abandonment

Wells that are completed as dry holes are plugged according to a plan designed specifically for the down hole conditions of each well. Plugging is accomplished by the placing of cement plugs at strategic locations downhole and up to the surface. Drilling mud is used as a spacer between plugs to prevent communication between fluid bearing zones. The casing is cut off at least three feet below ground level and capped by welding a steel plate on the casing stub. It is predicted that the one exploratory well drilled, will be plugged and abandoned.

Surface Impacts of Plugging and Abandonment

After plugging, all equipment and debris would be removed and the drill site would be restored as near

as reasonably possible to its original condition. If the new roads constructed for drilling are not needed for future access to the area, the roads would be reclaimed as required by the Authorized Officer.

Reasonably Foreseeable Development of Geothermal Resources (Common to All Alternatives)

Future Trends and Assumptions

With environmental protection and enhancement being a major consideration in the Pacific Northwest, clean, low-impacting energy sources are becoming more important. The energy surplus in the region is expected to be gone near the end of the decade. The abundant geothermal resources thought to be present in the Northwest are essentially undeveloped. To encourage resource development, the Bonneville Power Administration is offering to participate in three geothermal pilot projects. One of the projects selected is in the Medicine Lake Highlands area in northern California, just south of the planning area. With this renewed interest in geothermal energy it is anticipated that areas exhibiting geothermal potential, such as Klamath Falls, will experience an increase in geothermal exploration and possibly development.

Development of Geothermal Resources

Geophysical/Geochemical Exploration

As with oil and gas, geothermal geophysical operations can take place on leased or unleased public land. Depending upon the status of the land (leased/unleased), the status of the applicant (lessee/nonlessee), and the type of geophysical operation proposed, (drilling/non-drilling), several types of authorizations can be used if the proposed exploration exceeds "casual use", as defined in 43 CFR 3209.0-5(c). In all cases, the authorizations

require compliance with the National Environmental Policy Act and approval by the Authorized Officer. As with oil and gas, the operator is required to comply with all terms and conditions of the permits, regulations, and other requirements, including reclamation, prescribed by the Authorized Officer. Monitoring for compliance with these requirements will be done during the execution of the operations and upon completion.

In addition to the geophysical methods discussed in the Oil and Gas section, the following exploration techniques are often employed in geothermal prospecting:

Microseismic: Small seismometers are buried at a shallow depth (hand-dug holes) and transmit signals from naturally-occurring, extremely minor seismic activity (micro-earthquakes) to an amplifier on the surface. Stations are located away from roads to avoid traffic "noise". These units are often backpacked into areas inaccessible to vehicles.

Resistivity: Induced polarization (IP) techniques are used to measure the resistance of subsurface rocks to the passage of an electric current. A vehicle-mounted transmitter sends pulses of electrical current into the ground through two widely spaced electrodes (usually about two miles apart). The behavior of these electrical pulses as they travel through underlying rocks is recorded by "pots" (potential electrodes), small ceramic devices that receive the current at different locations. The electrodes are either short (two to three feet) rods driven into the ground, or aluminum foil shallowly buried over an area of several square feet. Two or three small trucks transport the crew of three to five people to transmitting and receiving sites.

Telluric: A string of "pots" record the variations in the natural electrical currents in the earth. No transmitter is required. Small trucks are used to transport the crew and equipment.

Radiometric: Radioactive emissions (generally radon gas) associated with geothermal resources are usually measured using a hand-held scintillometer, often at hot spring locations. Another method used involves placing plastic cups containing small detector strips sensitive to alpha radiation either on the surface or in shallow hand-dug holes. If holes are dug, they are covered, and the cups left in place for three to four weeks. At the end of the sampling period, the cups are retrieved and all holes are backfilled. These surveys can be conducted on foot or with the aid of light vehicles.

Geochemical Surveys: Geochemical surveys are usually conducted at hot springs by taking water samples directly from the spring. Sampling for mercury associated with geothermal resources is often done by taking soil samples using hand tools. These surveys can be conducted on foot or with the aid of light vehicles.

Temperature Gradient Drill Hole Surveys: Temperature gradient holes are used to determine the rate of change of temperature with respect to depth. Temperature gradient holes usually vary in diameter from about 3i - 4i inches, and from a few hundred feet to about 5000 feet in depth. They are drilled using rotary or coring methods. Drilling mud and fluids would be contained in earthen pits or steel tanks. Water for drilling would be hauled in water trucks, or if suitable water sources are close, could be piped directly to the site. Water consumption could range from about 2,000-6,000 gallons per day, with as much as 20,000 gallons per day under extreme lost circulation conditions.

Depending upon the location and proposed depth of the drill hole, detailed plans of operation that cover drilling methods, casing and cementing programs, well control, and plugging and abandonment may be required.

Based upon past geothermal exploration in Oregon, the area's potential, and recognizing a projected increase in power demand in the northwest by the end of the decade, it is anticipated that during the 10 year life of this plan, no Notices of Intent for surface geophysical surveys, and no Notice of Intent to drill temperature gradient holes will be filed. For analysis purposes, two notices of intent for geophysical work and one notice of intent for drilling for two holes will be analyzed.

Surface Impacts of Geothermal Exploration

The surface impacts of geophysical surveys (microseismic, resistivity, telluric, radiometric and geochemical) are anticipated to be negligible, utilizing existing roads for vehicle access to or near the exploration area. Exploration areas for the small seismometers, electrodes, and geochemical sampling areas are not anticipated to exceed 0.1 acre (total).

The surface disturbance anticipated from two temperature gradient holes is anticipated to involve 0.1 acre per drill site, involving 0.2 acre total. Each

drill site could contain the drill rig, most likely truck mounted, water truck(s), fuel tank, supply trailer, and a small trailer for the workers. Drilling mud and fluids would be contained in earthen pits or steel tanks. Water for drilling would be hauled in water trucks, or if suitable water sources are nearby, could be piped directly to the site. Water consumption could range from about 2,000-6,000 gallons per day, with as much as 20,000 gallons per day under extreme lost circulation conditions. Existing roads would be used, but short spur trails (probably less than 500 feet long and 20 feet wide) would be constructed for both of these holes, affecting approximately 0.5 acre. Both holes would be plugged and abandoned to protect both surface and subsurface resources, including aquifers. Reclamation of disturbed areas would be required, unless some benefit to the public could be gained, such as a water well or camping area.

Drilling and Testing

Drilling to determine the presence of geothermal resources or to test, develop, produce, or inject these resources can be done only on land covered by a geothermal resources lease. Close coordination with the State would take place. It is anticipated that the duration of well development, testing, and if dry, abandonment, would be four months.

Prior to abandonment, the operator would be required to plug the hole to prevent contamination of aquifers and any impacts to subsurface and surface resources. Plugging is accomplished by the placing of cement plugs at strategic locations downhole and up to the surface. Depending upon the formations encountered, drilling mud could be used as a spacer between plugs to prevent communication between fluid bearing zones. The casing is cut off at least six feet below ground level and capped by welding a steel plate on the casing stub.

It is estimated that one exploratory well would be drilled during the 10 year life of this plan.

Surface Impacts of Drilling

The geothermal well drilling operation would require approximately one acre for a well pad, including reserve pit. It is expected that existing roads would be used to access the drill site but about a half mile of moderate duty access road up to 40 feet wide with ditches, cuts, and fills, would also be necessary. Approximately 2.5 acres would be disturbed by this new road construction. Total surface disturbance for

the well and new road construction is expected to be about 3.5 acres.

After plugging, all equipment and debris would be removed, and the site would be restored as near as reasonably possible to its original condition. A dry hole marker would be placed at the surface or buried to identify the well location. If the new road is not needed for other purposes, it would be reclaimed as directed by the Authorized Officer.

Geothermal Power Plant Development

It is projected that no power plants will be constructed on BLM lands in the operating area during the life of this plan.

Direct Use of Geothermal Energy

It is projected that no direct use of geothermal energy will be utilized on BLM lands in the operating area during the life of this plan.

Locatable Minerals

Reasonably Foreseeable Development of Locatable Mineral Resources (Common to All Alternatives)

Future Trends and Assumptions

The major commodities of interest will continue to be the precious metals, gold and silver. This is based on a combination of price (especially gold) and the favorable geology for mineral occurrences. Reclamation science will continue to advance due to experience and research. A more detailed design effort will be placed on the reclamation of mined lands in the future. This will result in an overall increase in reclamation costs but those costs should pay dividends in the long-term with increased reclamation success.

The economics of mining in the planning area will be driven by the relationship between production costs and the market price of the commodity. While production costs can be controlled, or anticipated

through management and technology, the big unknown will be in the price of the mineral commodities, especially gold. The overall profitability of an operation, and hence the level of activity at the prospecting, exploration, and mining phases, for development of ore bodies will be closely related to the price of the mineral commodity.

No chemical heap leaching operations are forecasted during the plan period. If such an operation is proposed during the life of the plan, it will be subjected to environmental review under a Plan of Operations pursuant to regulations found in 43 CFR 3809. All locatable mineral operations will be monitored pursuant to these regulations and the policies shown below.

Development of Locatable Mineral Resources

Exploration Phase

Reconnaissance

Reconnaissance level activity is the first stage in exploring for a mineral deposit. This involves the initial literature search of an area of interest, using available references such as publications, reports, maps, aerial photos, etc. The area of study can vary from hundreds to thousands of square miles. Activity that will normally take place includes large scale mapping, regional geochemical and geophysical studies, and remote sensing with aerial photography or satellite imagery. The type of surface disturbing activity associated with reconnaissance level mineral inventory is usually no more than occasional stream sediment, soil or rock sampling. Minor off-road vehicle use may be required.

Prospecting

As the result of anomalous geochemical or geophysical readings, an unique geologic structure or feature, an occurrence of typical mineral bearing formations, or a historical reference to past mineral occurrence, the prospecting area of interest is identified through reconnaissance. This area may range from a single square mile to an entire mountain range of several hundred square miles.

Activity that will take place in an effort to locate a mineral prospect includes more detailed mapping, sampling, geochemical and geophysical study programs. This is the time when property acquisition efforts usually begin and most mining claims are located in order to secure ground while trying to make a mineral discovery.

Surface Impacts of Reconnaissance and Prospecting

Types of surface disturbing activity associated with prospecting generally involve soil and rock chip sampling using mostly hand tools, possibly off-road vehicle use, and placement and maintenance of mining claim monuments. This activity is normally considered "casual use" (43 CFR 3809.1-2) and does not require BLM notification or approval. Surface disturbances by these activities are anticipated to be less than 0.01 acre for each prospecting venture.

Exploration

Upon location of a sufficiently anomalous mineral occurrence, or favorable occurrence indicator, a mineral prospect is established and is subjected to more intense evaluation through exploration techniques. Activities that take place during exploration include those utilized during prospecting but at a more intense level in a smaller area. In addition, activities such as road building, trenching, and drilling are conducted. In later stages of exploration, an exploratory adit or shaft may be driven. If the prospect already has underground workings these may be sampled, drilled, or extended. Exploration activities utilize mechanized earth moving equipment and drill rigs, and may involve the use of explosives.

Surface Impacts of Placer Exploration

Placer exploration consists of test pit digging either by hand or with a backhoe or hydraulic excavator. It is predicted that ten Notices will be filed pertaining to placer deposit exploration. A typical Notice will describe minor road construction necessary for accessing three test pit locations. The size of each test pit is predicted to be about five feet x five feet and ten to 15 feet deep. It is anticipated that three temporary access roads approximately 200 feet long and 25 feet wide will be necessary to reach the test pit locations with the equipment, affecting roughly a total of 0.3 acre for new roads. Support facilities would utilize approximately one acre. Therefore, each

Notice-level operation would utilize approximately 1.3 acres of land, and during the plan period the expected ten operations would disturb about a total of 13 acres of land.

If low mineral values are discovered, then the pits will be backfilled and the area seeded and fertilized. It is anticipated that one notice-level operation will find mineral values significant enough to develop into a plan-level of operation which is described as a bench placer mine development later in this appendix.

Surface Impacts of Lode Exploration

It is anticipated that 20 Notices will be filed, pertaining to vein lode exploration. Exploratory work including drilling, blasting, and bulk sampling will be the emphasis of these projected notice-level operations. Some road and trail construction is anticipated for the operator to access the exploration sites for sample collection.

For each Notice, it is anticipated that three temporary access roads, 200 feet long by 40 feet wide (including cuts, fills, and ditches), would be necessary for equipment to reach the exploration sites. Surface disturbance for roads therefore, would be approximately 0.5 acre per notice. Support facilities would most likely be needed and would involve the use of about one acre per notice. The mineral sample sites (including three drill sites and two bulk sample sites) would probably disturb about 0.5 acre. Therefore, for each notice, approximately two acres would be affected by exploration of lode mineral deposits, and for the 20 Notices, a total of approximately 40 acres would be affected.

It is anticipated that one Plan of Operation would be filed during the plan period pursuant to 43 CFR 3809.1-4. It is predicted to be a disseminated gold exploration project, and approximately ten holes would be drilled utilizing truck mounted drill rigs. Each drill site would disturb less than a tenth of an acre. Temporary access roads, would be constructed for about three of the drill holes, but in most cases the existing roads would be utilized. Each of these temporary access roads would be approximately 300 feet long and 40 feet wide, including roadcuts, ditches, and fill slopes involving approximately 0.25 acre for each road (0.75 acre total). Support facilities might be necessary, affecting approximately one acre. Therefore, during the first phase of exploration, it is anticipated that 2.75 acres would be disturbed.

In the second phase of exploration, it is predicted that the operator will conduct drilling and sampling on a defined grid in order to better evaluate the amount of ore reserves within the project area. Additional equipment access roads will be necessary to complete this exploratory drilling and it is estimated that ten temporary access roads (of the length and width mentioned above) would be necessary in order to conduct this drilling, affecting about 2.5 acres. The ten new drill holes would disturb about a total of one acre. Therefore, the second phase of exploration would disturb an additional 3.5 acres. The total anticipated acreage involved in the plan-level lode exploration project would be approximately 6.25 acres.

Mining Phase

Mine Development

If exploration results show that an economically viable mineral deposit is present, activity intensifies to obtain detailed knowledge regarding reserves, possible mining methods, and mineral processing requirements. This involves applying all the previously utilized exploration tools in a more intense effort. Once enough information is acquired, a feasibility study is made to decide whether to proceed with mine development and which mining and ore processing methods will be utilized. It is anticipated that one bench placer and one lode deposit will be developed during the duration of this resource management plan. Both operations would be monitored under approved plans of operation.

Once the decision to develop the property is made, the mine permitting process begins. Upon approval, work begins on development of the mine infrastructure. This includes construction of the mill, offices and laboratory; prestripping in preparation for open pit mining; building of access roads or haulage routes, and placement of utility services. During this time, additional refinement of ore reserves is made.

Once enough facilities are in place, actual mine production begins. Concurrent with production there often are "satellite" exploration efforts to expand the mine's reserve base and extend the project life. Reclamation of the property is conducted concurrently with, or upon completion of, the mining operation. Often subeconomic resources remain unmined and the property is dormant, waiting for changes in commodity price or production technology that would make these resources economic.

Activities that could occur on these lands include: actual mining, ore processing, tailings disposal, waste rock placement, solution processing, metal refining, and placement of support facilities such as repair shops, labs, and offices. Such activities involve the use of heavy earthmoving equipment and explosives for mining and materials handling, exploration equipment for refinement of the ore reserve base, hazardous or dangerous reagents for processing requirements, and general construction activities.

The size of mines varies greatly and not all mines would require all the previously mentioned facilities and equipment. Acreage involved can range from several acres to several hundred, with most projects disturbing ten acres or less and requiring either a Notice or a Plan of Operations.

Bench Placer Mine

Bench placer operations can vary in size from one person to six persons operating excavators, backhoes, loaders, larger dozers, trommels, vibratory wash plants, draglines, and sluice boxes. Other associated equipment includes water pumps, generators, and conveyors. These operations vary in scope, processing between 10 to 500 loose cubic yards of gravel per day. The average operation of this type processes 50 cubic yards per day, operating 90 days per year.

The mining process could be generalized as follows: vegetation and overburden clearing, excavation of bench gravels, haul mineral bearing gravels to processing plant, washing gravel in plant with water, concentration of heavy metal in sluice box, and placement of tailings back into the excavated area as part of the reclamation plan.

Surface Impacts of Bench Placer Development

It is anticipated that the excavation area for mineral extraction would disturb approximately five acres. The finer material that washes over the sluice box is allowed to settle out in settling ponds to prevent siltation of adjacent streams. The water in the pond can be recycled through the wash plant to conserve water, and after the tailings are contoured for reclamation, the soil can be spread over the gravels and reseeded. Other associated activities include the need for support facilities (0.75 acre), road construction for access and ore haul routes (approximately 0.75 acre), construction of settling

ponds approximately 200' x 60' x 15' deep each (0.5 acre total), water diversion for a wash plant, and in extreme cases the streams might be diverted into alternate channels so that the stream channel can be mined following issuance of the necessary State permits. Approximately 0.5 acre would be needed for stockpiling overburden and topsoil to be used during site reclamation. Therefore, it is anticipated that the total disturbed area would involve approximately 7.5 acres for a bench placer mining operation.

Lode Mine

Mining operations at a hydrothermal gold deposit in the planning area will involve stripping of large amounts of overburden comprised not only of soil, but waste rock. Due to steep terrain, it is expected that the stockpile site for this material will be at a distance where the overburden will have to be hauled by truck and unloaded rather than pushed aside by bulldozer. Drilling, blasting and crushing the gold ore will be conducted at the site.

Surface Impacts of Lode Mine Development

The mine excavation area is anticipated to involve the disturbance of about 10 acres. It is anticipated that approximately two acres will be needed to stockpile overburden and topsoil near the mined area. Approximately two acres will be needed for support facilities and a staging area, and new haul roads would be needed, involving the disturbance of about two acres. Therefore, approximately 16 acres would be impacted by this lode mine development. Mineral processing is anticipated to be conducted elsewhere due to the steep topography.

Recreational Mining

Most recreational mining operations on BLM lands in the planning area are anticipated to utilize hand tools or portable suction dredges. Many of the recreational mining operations are expected to be conducted on mining claims in the Cow Creek drainage. Some recreational mining may also occur at the Cow Creek Recreation Site or at other locations throughout the District where casual use-level mineral specimen collecting has occurred. In situations where either camping (in excess of 14 days) or the use of motorized equipment is proposed, a Notice will be required of the operator.

In-stream dredging is usually a one to two person operation using a floating suction dredge with a five to seven horse power engine. The dredge pulls up all the gravel in the stream down to bedrock. The gravels are passed over a sluice box and are returned to the stream without the gold. This process does not require any chemicals. Most of the dredges have an intake nozzle opening of less than five inches diameter. The average stream area disturbed in any year is less than 1000 square feet per dredge operation, based on operations monitored in the past. Other activities associated with dredging include temporary occupancy and minor road and trail construction. It is predicted that 20 Notices will be filed for this type of mining activity.

Surface Impacts of Suction Dredging Operations

It is anticipated that approximately 0.15 acre would be disturbed by each in-stream suction dredging operation, and for each operation a camping area approximately 0.10 acre in size would be utilized. Therefore, during the plan period, the 20 anticipated Notices expected to be filed pertaining to these operations would affect a total of five acres of land.

It is anticipated that hobby mineral collecting and rockhounding will take place on the BLM lands in the operating area, however the surface impacts of those operations are presumed to be negligible since the mineral collectors most often use existing roads and look for surface geologic exposures. Any excavation of specimens is generally conducted with hand tools and is considered casual use.

Salable Mineral Resources – Reasonably Foreseeable Development Scenarios

Future Trends and Assumptions

It is anticipated that the public will continue to request the use of mineral materials from quarry sites located on the District. When possible, the use of existing sources is preferred, however new site development is not precluded in this plan.

Development of Salable Mineral Resources

The quality and quantity of the mineral materials available at a given site are important factors in the decision of whether or not a source is used by either the public or government agencies. The site location and distance to the point of use is another important consideration.

Surface Impacts of Quarry Development

All Alternatives

It is expected that two new quarry sites will be developed in the operating area during the plan period. On the average, each new site is expected to disturb approximately two acres of land. This acreage will be developed for use as a rock crushing operating area, truck turn around, access trails for

bulldozers and drills, overburden stockpile sites, and aggregate stockpile areas. For access to a new quarry site, approximately one-half acre of land will be disturbed by new road construction, most often affiliated with a timber sale contract. Therefore, it is anticipated that approximately five acres would be impacted by new quarry site development.

It is expected that the 60 existing quarry sites on this district will be utilized and possibly expanded during the plan period. Probably no more than ten percent of these sites would be expanded over the course of the plan period, and these expansions most likely would be less than two acres. In some cases, new vehicle access must be constructed to allow for such expansion and when this is the case, roughly one-tenth of an acre per site would be involved. Approximately 20 acres may be impacted by quarry site expansion under these alternatives.

It is expected that two of the existing quarry sites would be depleted in the operating area during the plan period. After all useable rock is removed, reclamation work would be conducted according to an approved interdisciplinary plan.

Soil Compaction, Erosion, and Nutrient Status

Soil disturbance usually is an unavoidable consequence of most management activities. The district's soils differ in their degree of sensitivity to disturbances. The type and magnitude of disturbance determine the effects on soil productivity. Timber management practices, including road construction, are the dominant management activities which create disturbances (compaction/displacement, surface erosion, mass wasting, and alteration of nutrient status).

Compaction/ Displacement

Soil compaction is the process where soil pore space is reduced because of physical pressure and vibration exerted on the soil surface. Compaction results in reduced plant growth due to reduced water infiltration, and gaseous and nutrient exchange rates. Physical resistance to root growth can occur with high soil densities. Compaction may also affect populations of soil organisms, but resultant tree growth impact is unknown.

Soil displacement is a process where a portion or all of the surface soil is moved by mechanical action. This may affect plant growth, depending on distance moved, by removing nutrients and soil organisms, and by reducing available water and rooting depth.

Timber harvest and site preparation methods together with soil conditions during operation influence the degree of soil compaction and displacement. The yarding system utilized during harvest affects the amount of soil disturbed. Amount of compaction/displacement created by ground-based yarding primarily depends on areal extent of yarding trails, soil moisture during yarding, number of passes over each trail, and amelioration practices used.

Amount of soil compaction/displacement and tree growth losses created by mechanical site preparation vary with differing conditions (amount of material to be piled, soil moisture, machine type and operation, depth of organic matter layers, number of machine passes, etc.). The more a log is suspended during yarding with a cable system, the less the soils are

disturbed, thus skyline systems generally disrupt less than highlead systems (Dyrness 1967). Hi-lead systems may disturb from 15-20 percent of the harvested area (Dyrness 1967, Sidle 1980). Skyline systems generally disturb less than 10 percent of the area, and aerial systems affect less than five percent of the ground (Dyrness 1967). Compaction, displacement, and mixing are the primary yarding disturbances. The significance of displacement and mixing of surface soils and organic materials on long term productivity is unknown. Cable yarding compaction growth effects are unknown.

The areal extent of detrimental soil compaction/displacement created by ground-based yarding can be minimized by utilizing designated skid trails that are restricted to a predetermined percentage of the harvest unit (Froehlich, et. al. 1981; Garland, 1982; BLM Compaction Guidelines, 1983). Detrimental soil compaction created by mechanical site preparation can be minimized or avoided by utilizing a tracked excavator and limiting the number of passes to two (forward and back) when soils are dry and most resistant to compaction. Tillage can fracture and ameliorate compacted soil. The degree of fracturing varies with tillage equipment, machine operation, and soil or site conditions (texture, moisture, coarse fragment content, etc.) Andrus and Froehlich (1983) reported fracturing of approximately 80 percent for properly designed winged rippers. Davis (1990) reported bulk densities of compacted areas tilled with a self-drafting winged subsoiler were not significantly different than those in uncompacted areas.

Although soil structure and pores are not returned to their natural condition by tillage, it is commonly accepted that tillage increases productivity of compacted soils. No research has been conducted that correlates the degree of fracturing and restoration of soil density with a similar degree of growth potential restoration.

Soil Erosion and Mass Wasting (Landsliding)

Surface erosion and mass wasting are two types of soil erosion that affect long term productivity of forest

soils. Both are naturally occurring geologic processes involving gravity, soil water, precipitation events, etc.

Surface soil erosion, which includes sheet, rill, gully, and dry raveling, is the detachment and movement of individual soil particles or aggregates downslope. It is caused either by the energy of rainfall and running water acting on bare soils, or by surface disturbance of steep slopes. In some of the higher elevation areas, freezing and thawing, especially on a daily basis, can cause considerable erosion on disturbed ground. This is particularly apparent in road cutbanks and areas with exposed soil.

Mass wasting (landsliding) is the downslope movement of soil and rock material. Volume of mass wasting events can range from a few cubic feet to thousands of cubic yards. Some of the more important factors that contribute to soil/slope instability are steep gradient, low soil strength, declining root strength, shallow soil depth, road construction, and a high frequency, long duration, and intense precipitation.

Several distinct types of mass movement are recognized. Debris avalanches and debris torrents are similar in that both occur on steep slopes, are fast moving, and are composed of soil, rock, water, and organic material. Torrents are water charged and occur in drainages, whereas avalanches lack the high water content and may or may not occur in drainages. These are the most dangerous types of landsliding and usually produce the most dramatic on-site and off-site effects. Various slow moving types of mass movement such as shallow earth flows, rotational slumps, and deep-seated geologic events occur and are usually initiated by excessive water. Major concerns and impacts of mass wasting are public safety, private property, roads, bridges, water quality, and fisheries (see Chapter 4, Water Resources and Fish sections). Current, state-of-the-art road construction practices have dramatically reduced the landslide frequency rate from that of pre-1975 road construction practices.

Reduction in root strength following timber harvest and site preparation activities is possibly a significant cause of landsliding outside the area of road construction. These changes match the high frequency of landslides the first few years following timber harvest on slopes with high potential for failure in Western Oregon (Burroughs and Thomas 1977). Areas most sensitive to loss of root strength and subsequent translational-type (slip surface is relatively shallow, planar, and roughly parallel to the ground surface) landsliding usually are steep (70 percent +) slopes in concave positions over hard bedrock in areas of high rainfall. Rotational-type (slip surface is relatively deep and circular) landslides are less sensitive to the root strength factor but are sensitive to disturbances to soil and ground water and natural slope configuration.

Nutrient Status

Soil organic matter accumulation and cycling are related to site index. When compared to lower site indices, higher sites have more organic matter incorporated into the soil and a larger nitrogen pool. Therefore, productivity is usually more resilient on higher sites. For maintenance of long-term productivity, conservation of organic matter on low sites is more important than on high sites.

Harvest and site preparation intensities and frequencies influence the amount and composition of the surface organic layer. Conservation of small materials (needles, leaves, twigs) is important for site total nitrogen because these materials have the highest concentrations of nitrogen. When compared to needles and twigs, removal of large materials (stemwood and large branches) has less effect on site total nitrogen. However, the large materials are important for continuation of healthy symbiotic fungi populations (Maser et al 1978).

Appendix GG

Analytical Methods for Assessing Impacts on Wildlife Habitat and Populations

Roosevelt Elk

Assessment Method

Wisdom et al., A Model to Evaluate Elk Habitat in Western Oregon (modified)

Note to Reader: The Wisdom Model is modified to reflect the scale of planning at the forestwide level. The major modification is to drop the spacing index (HE). The HE_i index will be calculated for both BLM and non-BLM lands within the analysis areas, but the HE_c and HE_i indicates will be calculated only for BLM lands due to the lack of vegetation data for non-BLM lands.

Assumptions/Comments

1. Evaluations will be conducted for each elk management area with substantial existing or potential elk use and where BLM has at least 25 percent ownership.
2. See wisdom et al. (p. 11) for a complete list of assumptions pertinent to use of the model.
3. Use the following forest stages as a guide:
 - Forage areas = 0-20 years.
 - Hiding cover = 21-50 years with appropriate stocking classes.
 - Thermal cover = 51-160 years with appropriate stocking classes.
 - Optimal cover = 160+ years with appropriate stocking classes.

Analytical Techniques

1. Road Density (HE_r):
 - a. Determine miles of drivable roads within each elk management area for the existing

condition. Divide miles of road by acres of WODDB coverage within each area to determine road density. Compare density to the desired 1.5 mile benchmark recommended in the ODFW Forest Habitat Protection Criteria for BLM lands (1990).

- b. Estimate shifts in HE_i within each analysis area by reference to the Ten Year Timber Harvest Scenario (i.e., determine proposed road construction levels over the next decade and project a positive, negative, or neutral change in road density).
 - c. Write narrative to predict long-term impacts (100 years) of road construction on elk for BLM and non-BLM-administered lands.
2. Cover Quality (HE_c):
 - a. Determine the amount of optimal (O) thermal cover, thermal (T) cover, and hiding (H) cover. Individual OI polygons have already been tagged with the above codes (i.e., O, T, H) based on stand age. Calculate HE_c according to Wisdom Model. Calculate percent optimal thermal cover, percent thermal cover, and percent hiding cover in area and compare to ODFW benchmarks (Forest Habitat Protection Criteria for BLM lands).
 - b. Estimate shifts in HE_c within each analysis area by reference to the Ten Year Timber Harvest Scenario and display as a positive, negative or neutral changes in cover quality conditions.
 - c. Write narrative to predict long-term impacts (100 years) on HE_c and cover percentages for BLM lands.
 3. Forage Quality (HE_f):
 - a. Use HE_f attribute in FOI theme to determine acres of forage by quality classes as described in Wisdom Model (p. 29)

- b. Calculate existing HE_i index according to Wisdom Model.
- c. Estimate shifts in HE_i within each analysis area by reference to the Ten Year Harvest Scenario and display as a positive, negative, or neutral change in forage quality conditions.
- d. Write narrative to predict long-term impacts (100 years) on HE_i for BLM lands.

Display Techniques

Display road density, cover, and forage/ HE_i , HE_i , HE_c , indices for each elk management area for existing condition. Use +/- techniques to evaluate changes of indices based on comparisons with Ten Year Timber Harvest Scenario and proposed road closures.

Dominant Woodpeckers

Assessment Method

Neitro et al. method to analyze multiple species snag requirements (described in Management of Wildlife and Fish Habitats in Forests of Western Oregon and Washington edited by E. Read Brown, 1985).

Assumptions

1. By managing for dominant woodpeckers, requirements of other cavity users will be fulfilled.
2. A direct correlation exists between snag densities and population densities of cavity users.
3. The following minimum guidelines have been established for all alternatives.

Wildlife trees (snags) will be greater than 20" dbh and at least 15 feet tall; green trees retained will generally be 20" dbh or greater with minimum tree size being 15" dbh.

Leave all soft snags except where they are unacceptable for safety, logging systems, or burning considerations.

Analytical Techniques

1. Estimate existing snag levels for each forest age class. These snag levels were estimated from projections of snag densities currently being measures on timber inventory plots. Snag densities were determined for the following conifer age classes: 1-30, 40-80, 90-190, and 200+.2.
2. Snag densities for each age class for the range of alternatives were determined using the ORGANON model to generate snag recruitment from suppression mortality and green tree retention mortality. Snag recruitment was then entered into the Marcot Snag Model to predict snag abundance over time.
3. Snags densities were determine for each stand age class for the current, short term (ten years), and long term (100 years) conditions. The number of snags in each age class was then weighed by the percent of forested acres in the age class to arrive at an average number of snag per acre for the District.
4. Convert calculate snag densities into districtwide estimates of potential population levels (i.e., percent of maximum population levels) of dominant woodpeckers for each alternative (see Neitro et al., p. 145).
5. In narrative form, discuss specific and cumulative effects of the alternatives on dominant woodpeckers and cavity users.

Appendix HH

Volume and Acres Harvested by Age Class by Decade

Table HH-1. Volume (MMCF) Harvested by Age Class by Decade

(Data corresponds to Figure HH-1)

Alternative NA

	Final Harvest				
	MMCF	MMCF	MMCF	MMCF	MMCF
Age	1st	2nd	3rd	5th	10th
30-39	0.0	0.0	0.0	0.0	0.0
40-49	0.0	0.0	0.0	0.0	0.0
50-59	0.0	0.0	2.6	197.0	163.5
60-79	0.0	0.0	86.8	109.9	139.4
80-99	0.0	0.0	70.2	0.0	0.0
100-199	15.0	273.8	166.8	0.0	0.0
200+	373.4	94.2	10.0	10.0	10.0
Total	388.4	368.0	336.5	316.9	312.9

Table HH-2. Acres Harvested by Age Class by Decade.

(Data corresponds to Figure HH-2)

Alternative NA

Age	Final Harvest				
	Acres 1st	Acres 2nd	Acres 3rd	Acres 5th	Acres 10th
30-39	0	0	0	0	0
40-49	0	0	0	0	0
50-59	0	0	570	36476	27571
60-79	0	0	12446	13557	17421
80-99	0	0	16284	0	0
100-199	2422	47612	32788	0	0
200+	47584	12966	1195	1208	1261
Total	50006	60578	63283	51241	46253

Data derived from output of 1983 NPA Simex ASQ Runs.

Table HH-3. Volume (MMCF) Harvested by Age Class by Decade

(Data corresponds to Figure HH-3)

Alternative A

Age	Final Harvest				
	MMCF 1st	MMCF 2nd	MMCF 3rd	MMCF 5th	MMCF 10th
30-39	0.0	0.0	0.0	0.0	95.0
40-49	0.0	0.0	0.0	0.0	381.7
50-59	0.0	0.0	40.1	431.2	0.0
60-79	0.0	0.0	134.4	16.7	0.0
80-99	0.0	0.0	75.8	0.0	0.0
100-199	0.0	334.9	218.9	0.0	0.0
200+	473.2	135.7	0.0	0.0	0.0
Total	473.2	470.6	469.2	447.8	476.7

Table HH-4. Acres Harvested by Age Class by Decade

(Data corresponds to Figure HH-4)

Alternative A

Age	Acres 1st	Acres 2nd	Acres 3rd	Acres 5th	Acres 10th
30-39	0	0	0	0	20384
40-49	0	0	0	0	53530
50-59	0	0	5800	55868	0
60-79	0	0	15993	2074	0
80-99	0	0	9294	0	0
100-199	0	51958	29270	0	0
200+	76583	20850	0	0	0
Total	76583	72808	60357	57942	73914

Data derived from TRIM-Plus ASQ harvest output files.
Results may differ slightly from other estimates generated as a result of the Ten-Year Scenario exercises.

Table HH-5. Volume (MMCF) Harvested by Age Class by Decade

(Data corresponds to Figure HH-5)

Alternative B

Age	Final Harvest				
	MMCF 1st	MMCF 2nd	MMCF 3rd	MMCF 5th	MMCF 10th
30-39	0.0	0.0	0.0	0.0	26.8
40-49	0.0	0.0	0.0	0.0	410.6
50-59	0.0	0.0	53.1	397.5	0.0
60-79	0.0	0.0	135.2	13.3	0.0
80-99	0.0	0.0	74.7	0.0	0.0
100-199	8.5	342.9	168.5	0.7	1.2
200+	428.5	90.9	0.8	1.0	1.6
Total	436.9	433.8	432.3	412.3	440.2

Table HH-6. Acres Harvested by Age Class by Decade

(Data corresponds to Figure HH-6)

Alternative B

Age	Final Harvest				
	Acres 1st	Acres 2nd	Acres 3rd	Acres 5th	Acres 10th
30-39	0	0	0	0	5460
40-49	0	0	0	0	57280
50-59	0	0	6593	52207	0
60-79	0	0	14985	1889	0
80-99	0	0	8561	0	0
100-199	1768	48774	22215	31	61
200+	65632	13330	40	46	74
Total	67400	62104	52394	54173	62875

Data derived from TRIM-Plus ASQ harvest output files.
Results may differ slightly from other estimates generated as a result of the Ten-Year Scenario exercises.

Table HH-7. Volume (MMCF) Harvested by Age Class by Decade

(Data corresponds to Figure HH-7)

Alternative C

Final or Regeneration Harvest

Age	MMCF 1st	MMCF 2nd	MMCF 3rd	MMCF 5th	MMCF 10th
30-39	0.0	0.0	0.0	0.0	0.0
40-49	0.0	0.0	0.0	0.0	0.0
50-59	0.0	0.0	0.0	0.0	0.0
60-79	0.0	0.0	4.8	12.7	0.0
80-99	0.0	0.0	0.0	0.0	0.0
100-199	54.7	53.7	51.3	7.5	90.5
200+	57.5	58.5	54.0	0.9	20.2
Total	112.2	112.2	110.1	21.1	110.7

Table HH-8. Acres Harvested by Age Class by Decade

(Data corresponds to Figure HH-8)

Alternative C

Final or Regeneration Harvest

Age	Acres 1st	Acres 2nd	Acres 3rd	Acres 5th	Acres 10th
30-39	0	0	0	0	0
40-49	0	0	0	0	0
50-59	0	0	0	0	0
60-79	0	0	810	1887	0
80-99	0	0	0	0	0
100-199	15572	13565	11382	1486	8575
200+	17869	15681	12856	121	2487
Total	33441	29246	25048	3494	11062

Data derived from TRIM-Plus ASQ harvest output files.
Results may differ slightly from other estimates generated.

Table HH-9. Volume (MMCF) Harvested by Age Class by Decade

(Data corresponds to Figure HH-9)

Alternative D

Age	Final Harvest				
	MMCF 1st	MMCF 2nd	MMCF 3rd	MMCF 5th	MMCF 10th
30-39	0.0	0.0	0.0	0.0	0.0
40-49	1.6	2.7	4.2	7.3	12.2
50-59	3.4	6.0	10.5	14.9	26.1
60-79	5.0	5.1	13.3	37.2	65.4
80-99	2.6	3.5	2.9	11.6	34.8
100-199	36.4	51.9	49.0	53.7	1.6
200+	91.1	70.9	60.1	15.3	0.0
Total	140.1	140.1	140.1	140.1	140.1

Table HH-10. Acres Harvested by Age Class by Decade

(Data corresponds to Figure HH-10)

Alternative D

Age	Final Harvest				
	Acres 1st	Acres 2nd	Acres 3rd	Acres 5th	Acres 10th
30-39	0	0	0	0	0
40-49	519	930	1597	3461	3131
50-59	635	1185	2251	4059	4645
60-79	635	795	2142	12006	10976
80-99	356	502	466	2328	4273
100-199	4367	6896	6854	7804	626
200+	12389	10235	9401	3029	0
Total	18900	20545	22710	32687	23650

Data derived from TRIM-Plus ASQ harvest output files. Results may differ slightly from other estimates generated as a result of the Ten-Year Scenario exercises. Harvest estimates set to their most constraining period. ASQ determination process differed from all other alternatives due to the 50-11-40 constraint. The TRIM-Plus model was not utilized.

Table HH-11. Volume (MMCF) Harvested by Age Class by Decade

(Data corresponds to Figure HH-11)

Alternative E

Age	Final Harvest				
	MMCF 1st	MMCF 2nd	MMCF 3rd	MMCF 5th	MMCF 10th
30-39	0.0	0.0	2.8	6.4	11.4
40-49	5.1	25.6	19.3	9.5	5.7
50-59	8.2	3.2	6.3	7.5	0.0
60-79	3.4	0.5	0.7	2.2	0.0
80-99	1.7	0.1	0.1	1.1	2.8
100-199	12.9	2.1	2.3	2.6	9.4
200+	0.2	0.0	0.0	0.0	1.8
Total	31.4	31.5	31.5	29.2	31.1

Table HH-12. Acres Harvested by Age Class by Decade

(Data corresponds to Figure HH-12)

Alternative E

Age	Final Harvest				
	Acres 1st	Acres 2nd	Acres 3rd	Acres 5th	Acres 10th
30-39	0	48	1326	1598	2811
40-49	1430	5428	4335	2134	879
50-59	1782	611	1202	1671	0
60-79	774	104	239	656	0
80-99	271	16	21	240	318
100-199	2396	339	348	370	1497
200+	34	3	2	3	225
Total	6687	6550	7474	6672	5730

Data derived from TRIM-Plus ASQ harvest output files.

Results may differ slightly from other estimates generated as a result of the Ten-Year Scenario exercises.
Final Harvest Acreage not revised for 20% Cavity Nesters.

Table HH-13. Volume (MMCF) Harvested by Age Class by Decade

(Data corresponds to Figure HH-13)

Alternative PRMP

Final or Regeneration Harvest					
Age	MMCF 1st	MMCF 2nd	MMCF 3rd	MMCF 5th	MMCF 10th
30-39	0.0	0.0	0.0	0.0	0.0
40-49	0.0	0.0	0.0	0.0	0.0
50-59	0.0	0.0	0.0	0.0	0.0
60-79	0.0	0.0	14.2	37.1	0.0
80-99	0.0	0.0	4.7	9.0	0.0
100-199	43.7	34.9	11.1	3.0	10.7
200+	22.7	30.8	29.0	8.1	40.5
Total	66.4	65.7	59.0	57.2	51.2

Table HH-14. Acres Harvested by Age Class by Decade

(Data corresponds to Figure HH-14)

Alternative PRMP

Final or Regeneration Harvest					
Age	Acres 1st	Acres 2nd	Acres 3rd	Acres 5th	Acres 10th
30-39	0	0	0	0	0
40-49	0	0	0	0	0
50-59	0	0	0	0	0
60-79	0	0	2009	4211	0
80-99	0	0	753	871	1153
100-199	7714	5876	2036	591	4121
200+	4161	5317	5010	1307	0
Total	11875	11193	9808	6980	5274

Data derived from TRIM-Plus PSQ harvest output files.

Results may differ slightly from other estimates generated as a result of the Ten-Year Scenario exercises.

Figure HH-1. Regeneration Harvest Volume by Age Class and Decade
 NA (No Action) Alternative - ASQ 405 MMCF/Decade

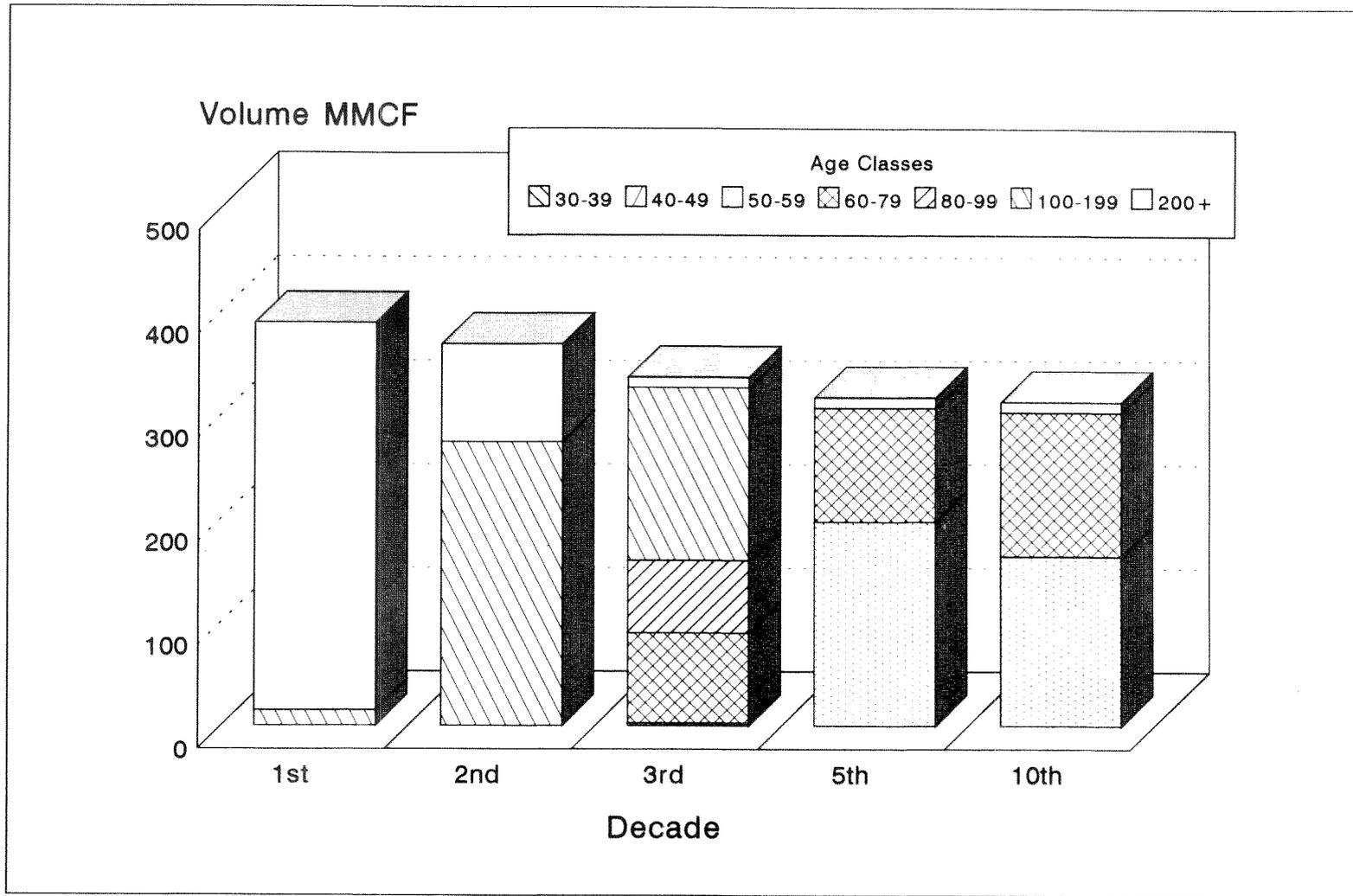
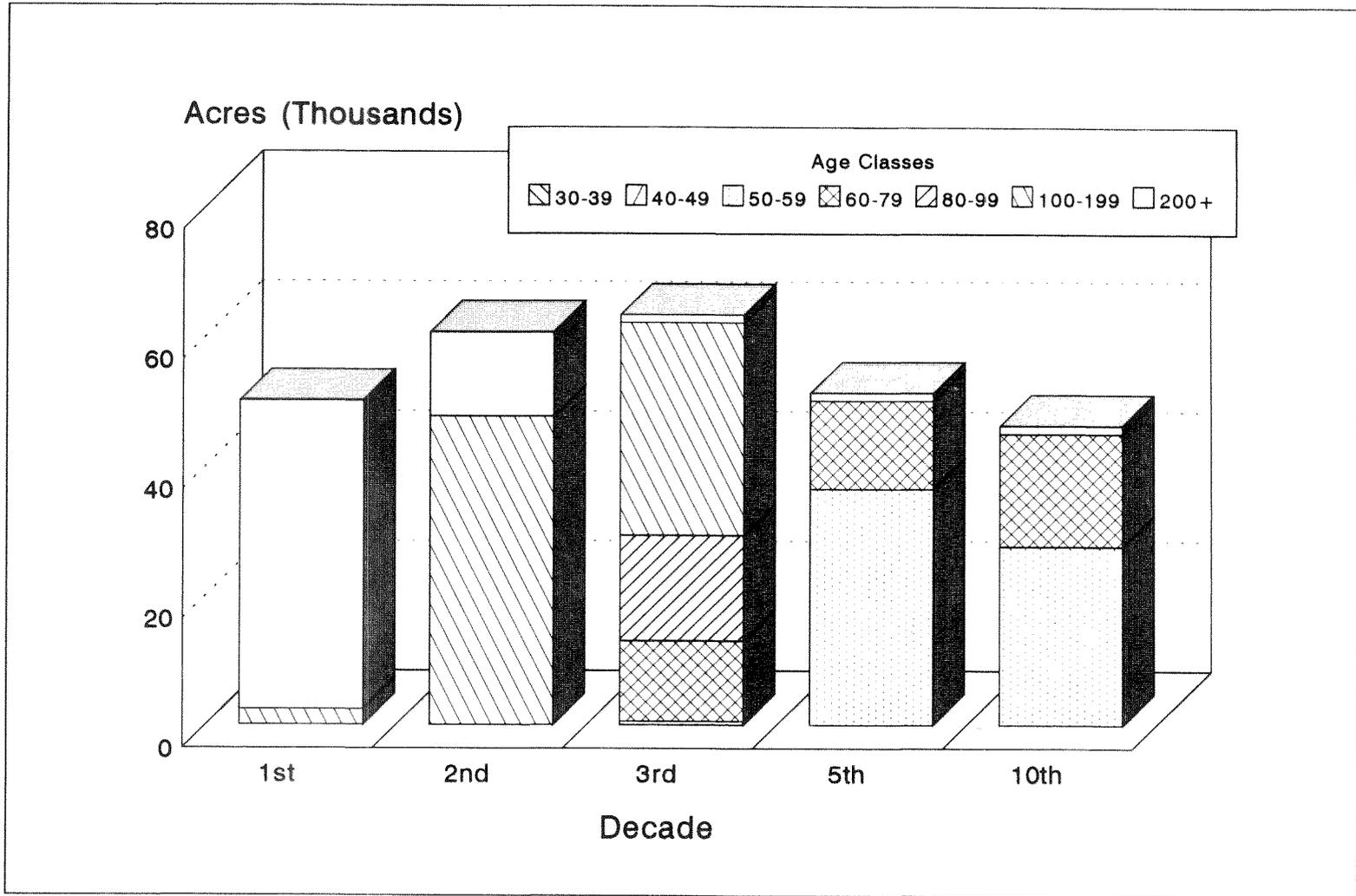


Figure HH-1. Regeneration Harvest Volume by Age Class and Decade. NA (No Action) Alternative - ASQ 405 MMCF/Decade.

Figure HH-2. Regeneration Harvest Acreage by Age Class and Decade
 NA (No Action) Alternative - ASQ 405 MMCF/Decade



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Figure HH-2. Regeneration Harvest Volume by Age Class and Decade. NA (No Action) Alternative - ASQ 405 MMCF/Decade.

Volume and Acres Harvested by Age Class by Decade

Figure HH-3. Regeneration Harvest Volume by Age Class and Decade
 Alternative A - ASQ 477 MMCF/Decade

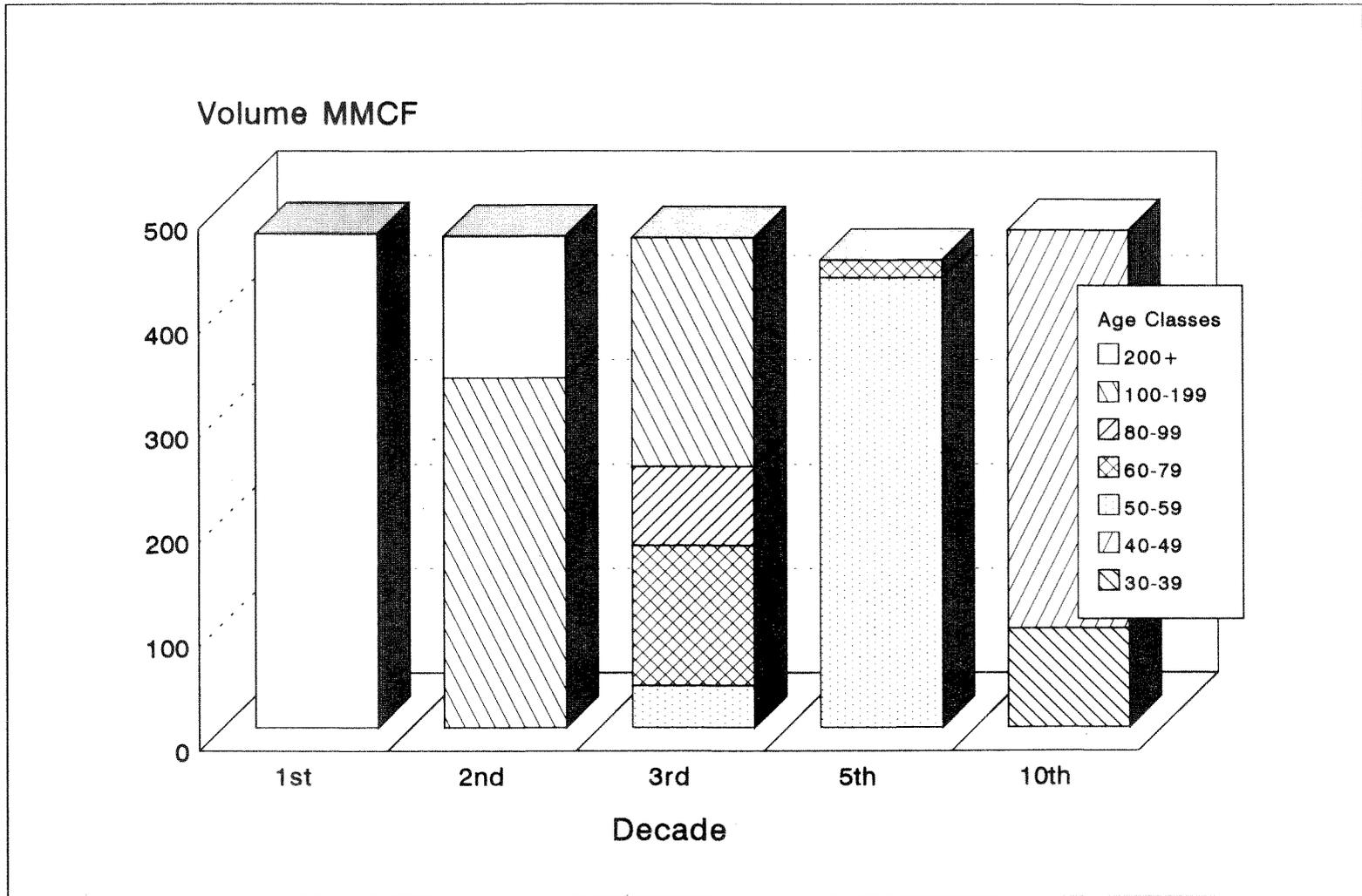


Figure HH-3. Regeneration Harvest Volume by Age Class and Decade. Alternative A- ASQ 477 MMCF/Decade

Figure HH-4. Regeneration Harvest Acreage by Age Class and Decade
 Alternative A - ASQ 477 MMCF/Decade

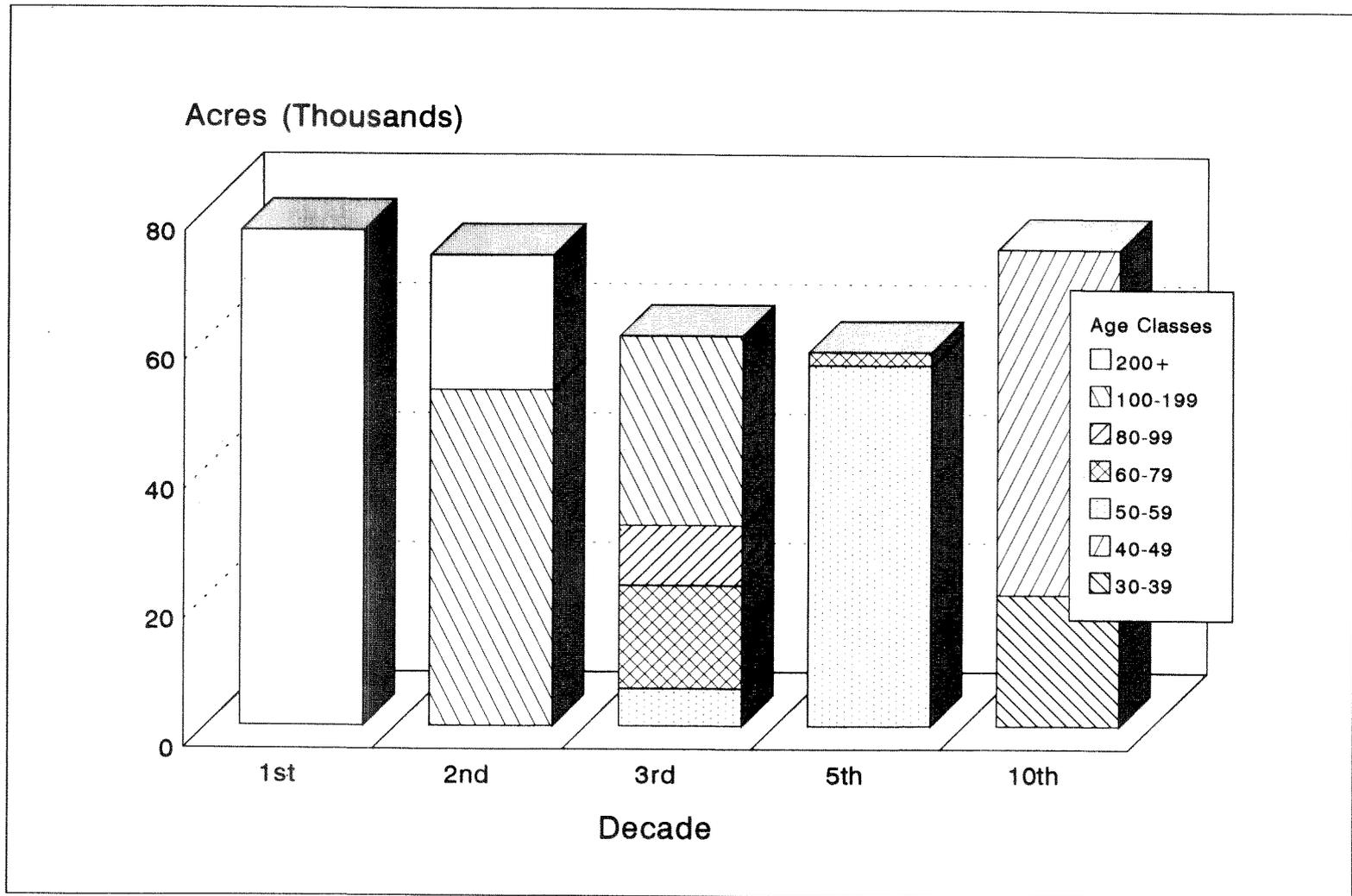


Figure HH-4. Regeneration Harvest Volume by Age Class and Decade. Alternative A- ASQ 477 MMCF/Decade

Figure HH-5. Regeneration Harvest Volume by Age Class and Decade
Alternative B - ASQ 440 MMCF/Decade

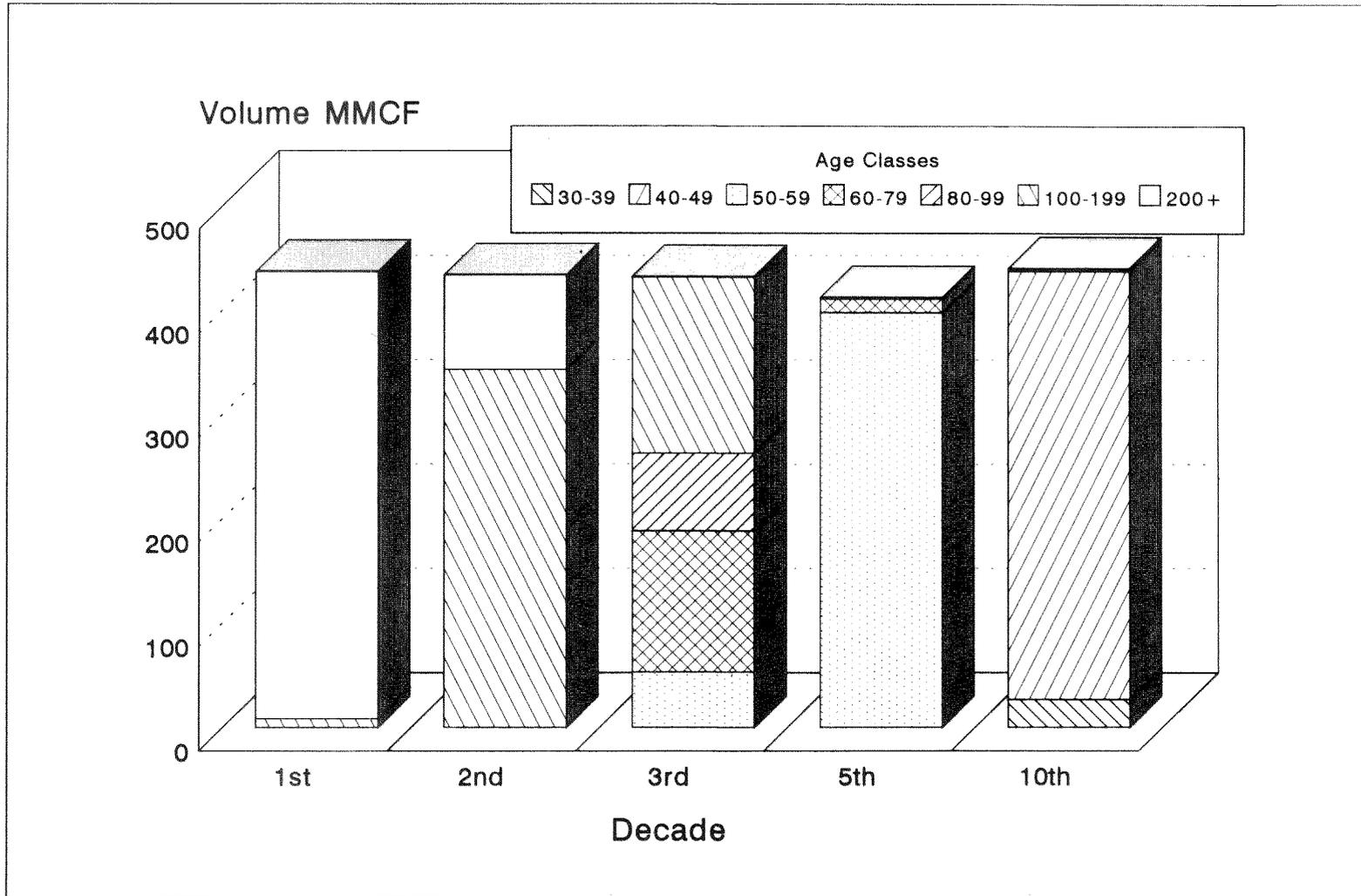


Figure HH-5. Regeneration Harvest Volume by Age Class and Decade. Alternative B- ASQ 440 MMCF/Decade

Figure HH-6. Regeneration Harvest Acreage by Age Class and Decade
Alternative B - ASQ 440 MMCF/Decade

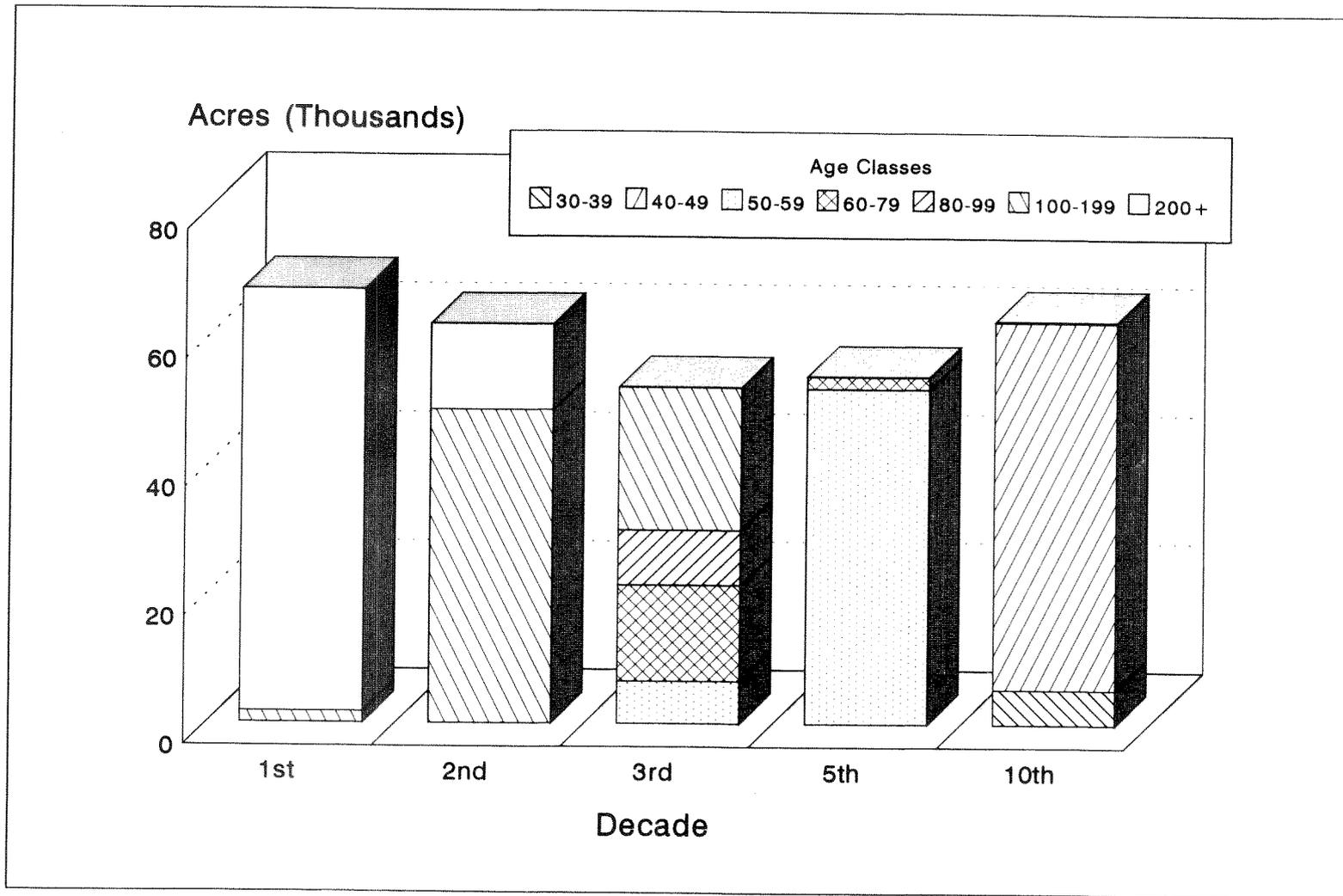


Figure HH-6. Regeneration Harvest Volume by Age Class and Decade. Alternative B- ASQ 440 MMCF/Decade

Figure HH-7. Regeneration Harvest Volume by Age Class and Decade
Alternative C - ASQ 112 MMCF/Decade

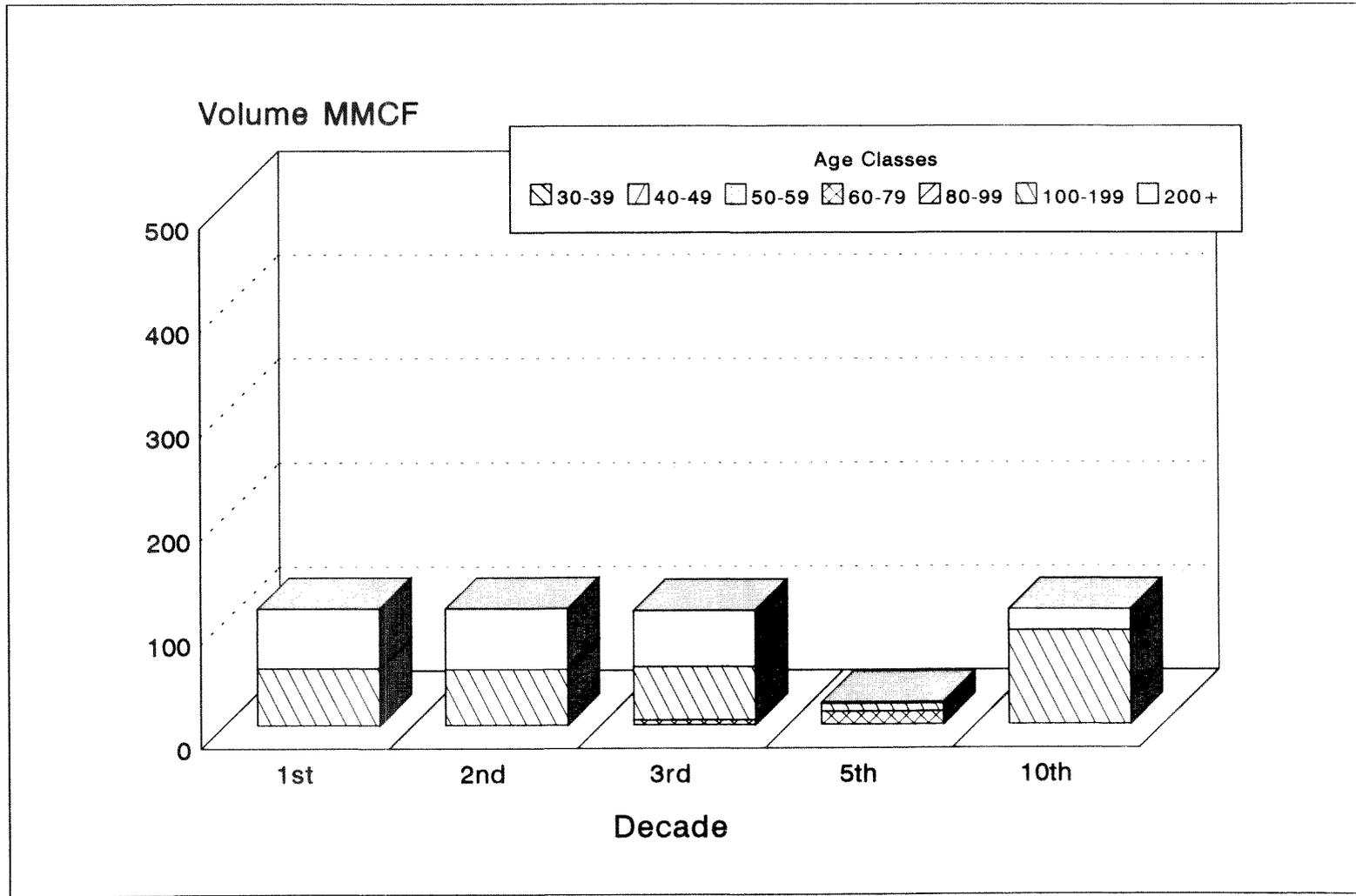


Figure HH-7. Regeneration Harvest Volume by Age Class and Decade. Alternative C- ASQ 112 MMCF/Decade

Figure HH-8. Regeneration Harvest Acreage by Age Class and Decade
Alternative C - ASQ 112 MMCF/Decade

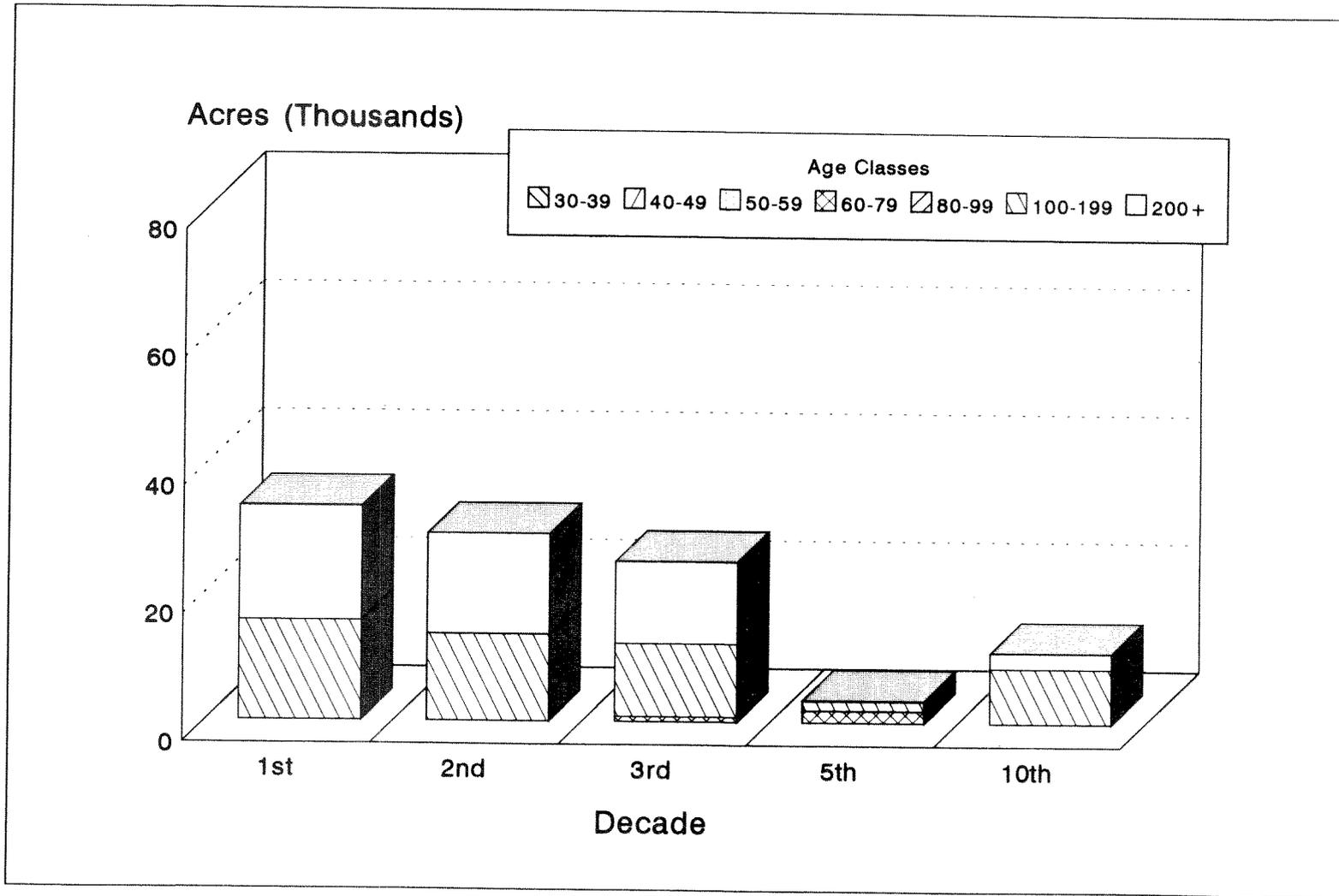


Figure HH-8. Regeneration Harvest Volume by Age Class and Decade. Alternative C- ASQ 112 MMCF/Decade

Figure HH-9. Regeneration Harvest Volume by Age Class and Decade
Alternative D - ASQ 143 MMCF/Decade

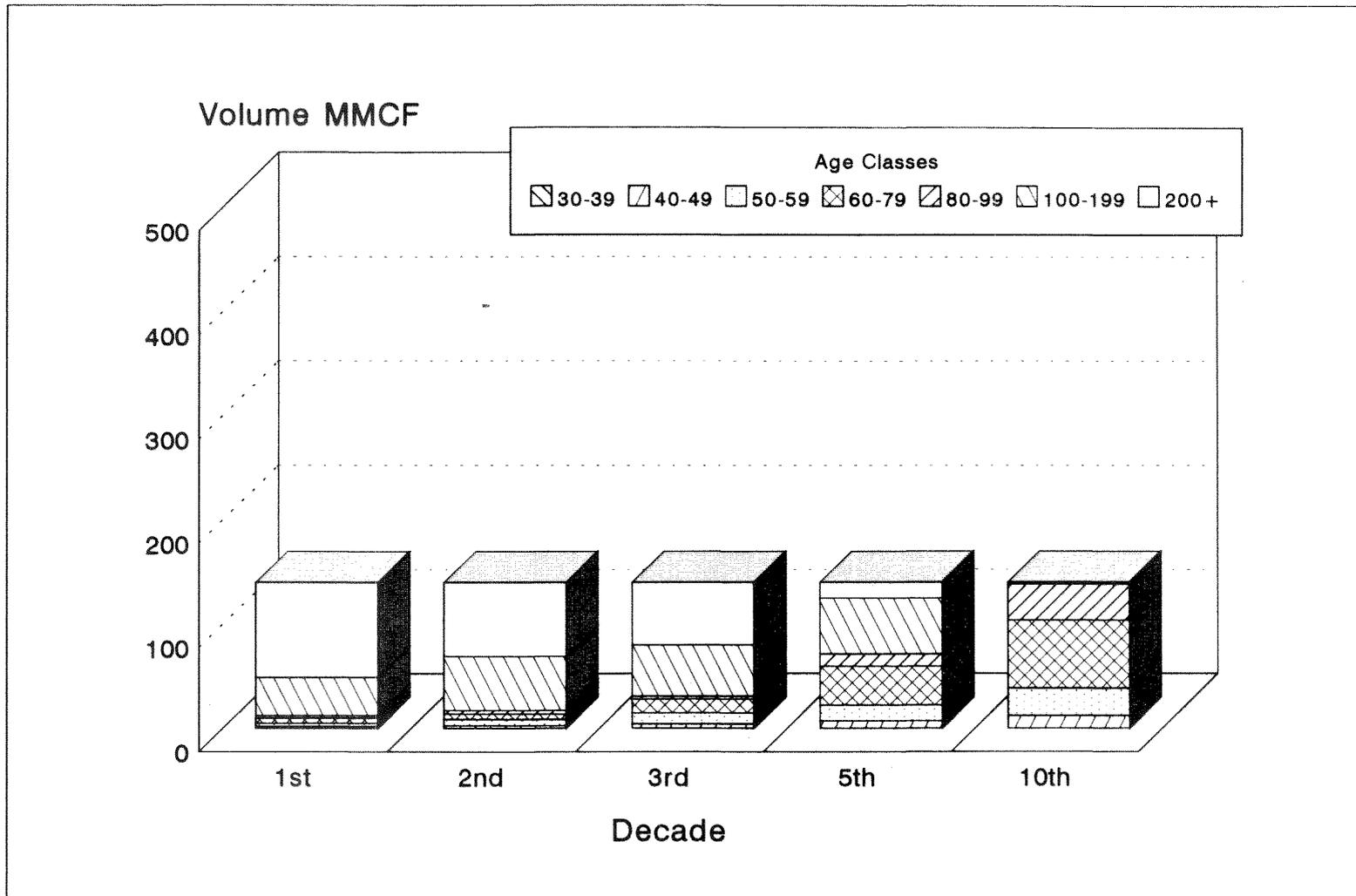
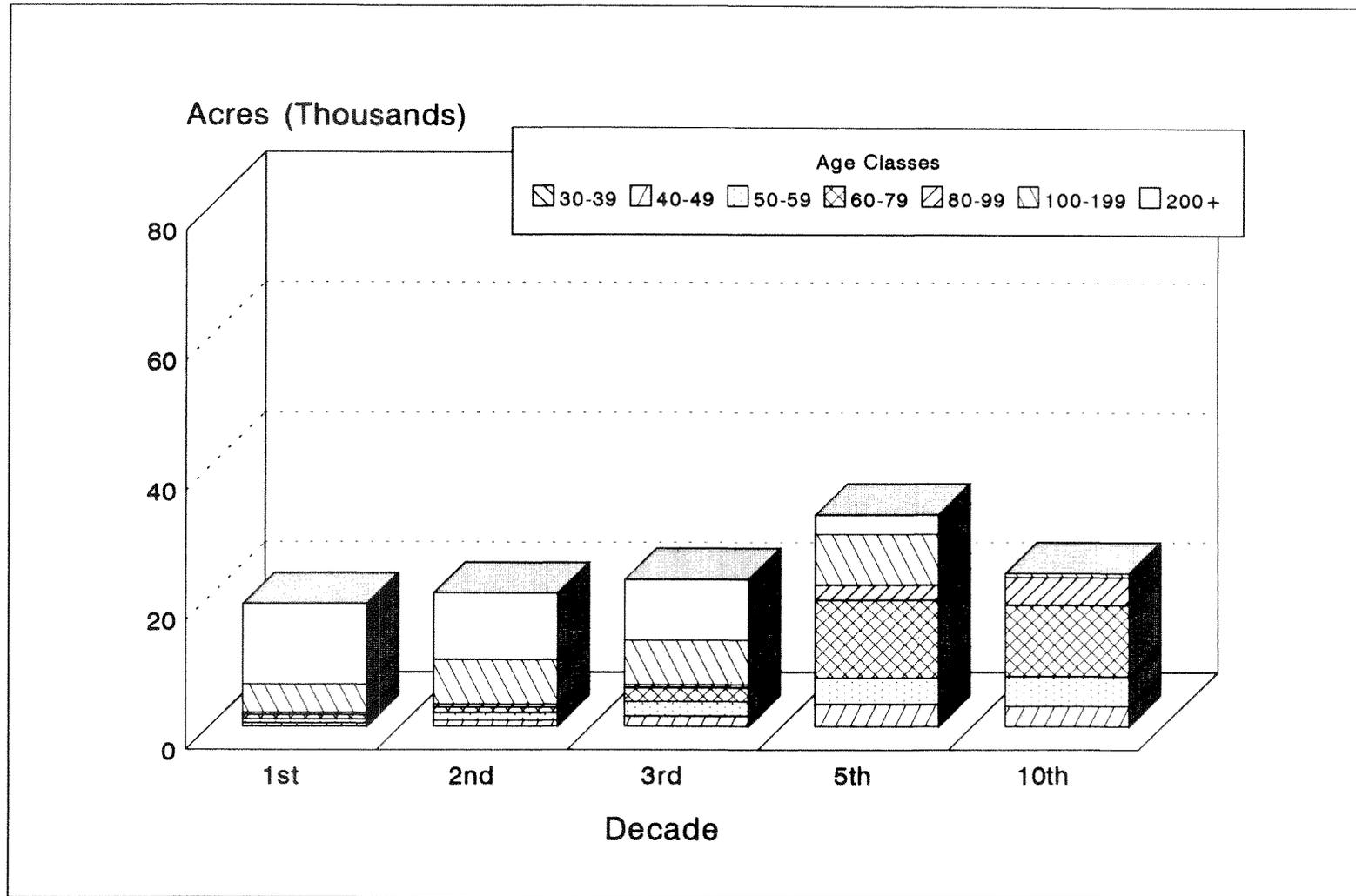


Figure HH-9. Regeneration Harvest Volume by Age Class and Decade. Alternative D- ASQ 143 MMCF/Decade

Figure HH-10. Regeneration Harvest Acreage by Age Class and Decade
Alternative D - ASQ 143 MMCF/Decade



Volume and Acres Harvested by Age Class by Decade

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Figure HH-10. Regeneration Harvest Volume by Age Class and Decade. Alternative D- ASQ 143 MMCF/Decade

Figure HH-11. Regeneration Harvest Volume by Age Class and Decade
 Alternative E - ASQ 32 MMCF/Decade

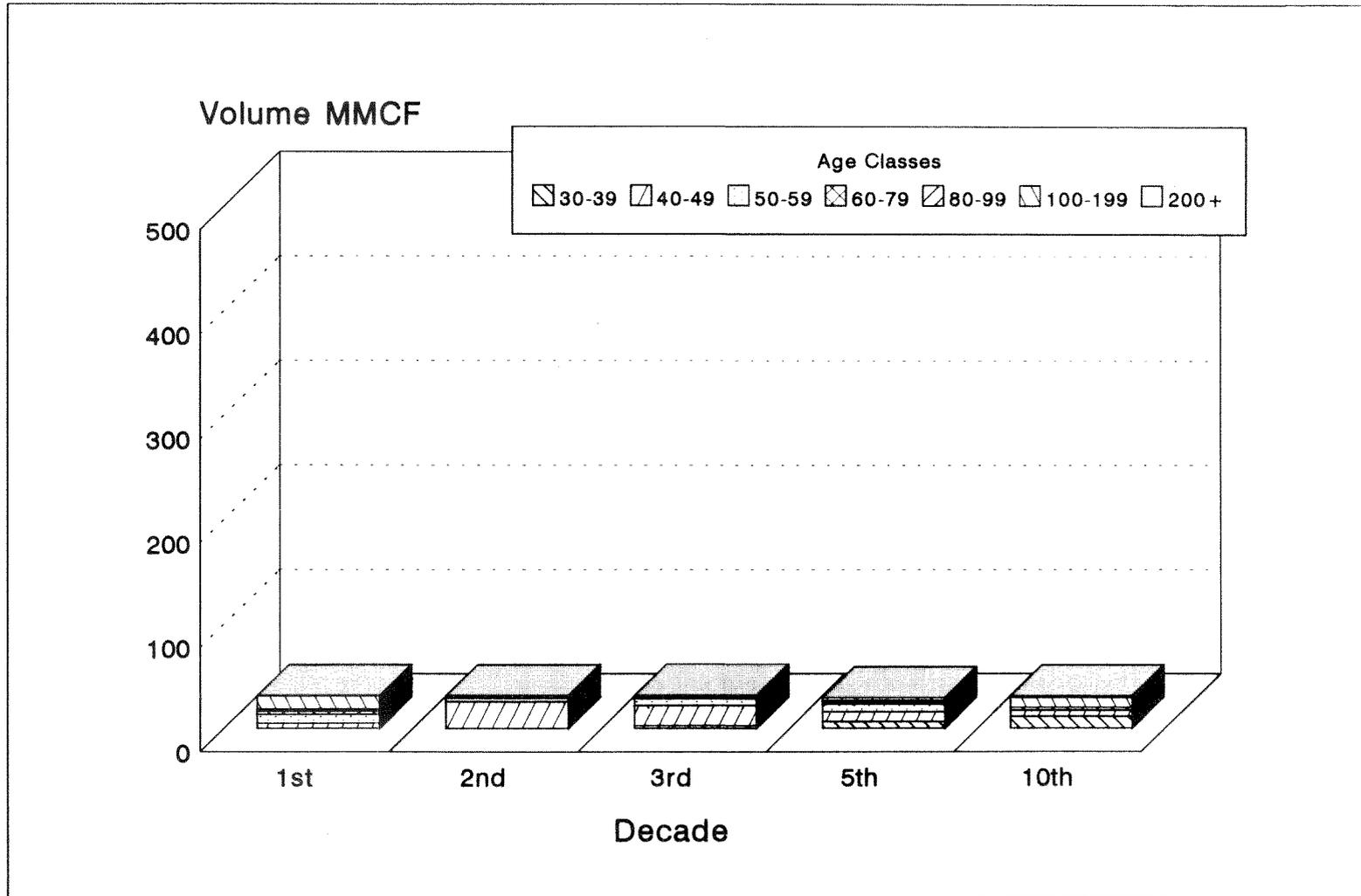


Figure HH-11. Regeneration Harvest Volume by Age Class and Decade. Alternative E- ASQ 32 MMCF/Decade

Figure HH-12. Regeneration Harvest Acreage by Age Class and Decade
Alternative E - ASQ 32 MMCF/Decade

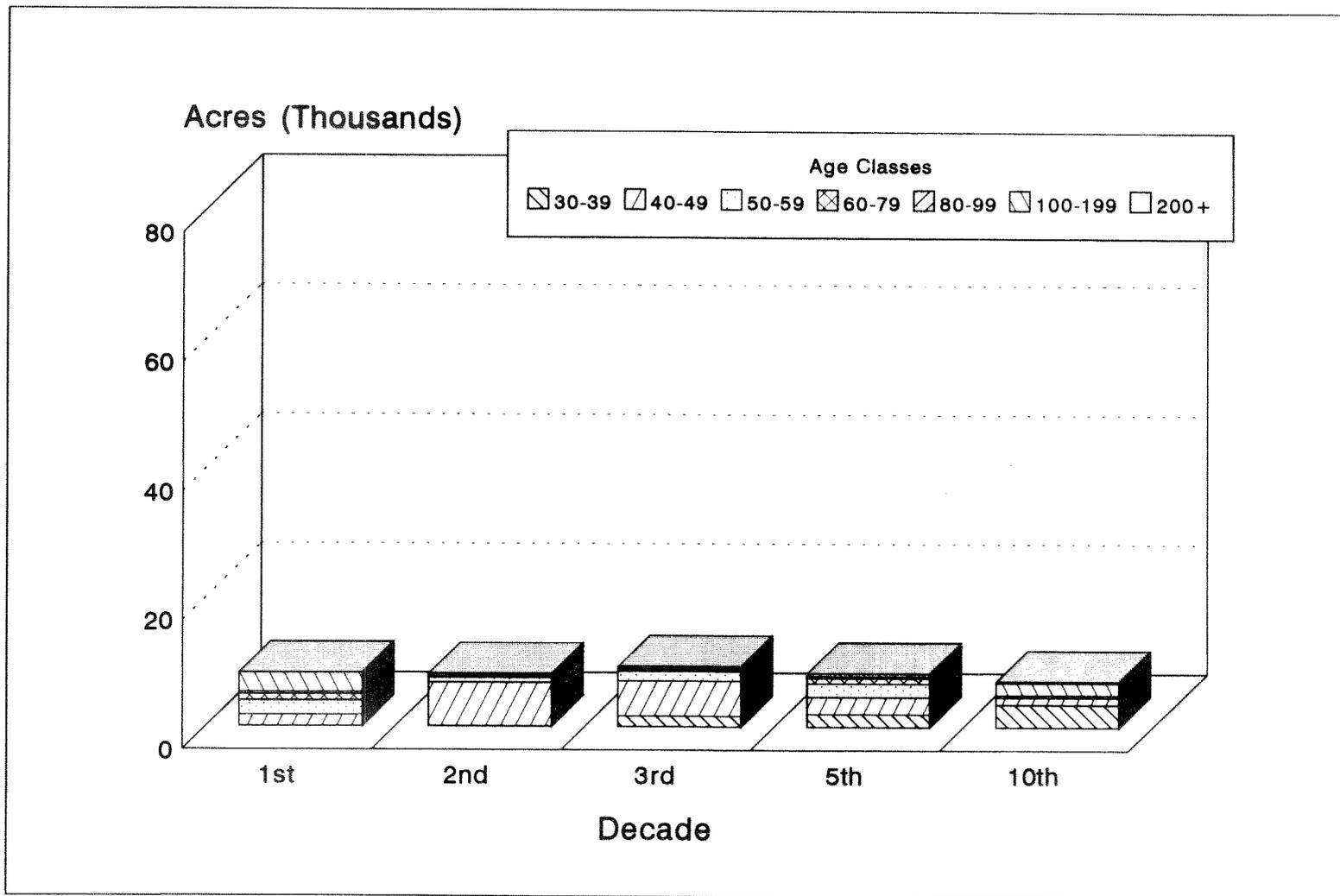


Figure HH-12. Regeneration Harvest Volume by Age Class and Decade. Alternative E- ASQ 32 MMCF/Decade

Figure HH-13. Regeneration Harvest Volume by Age Class and Decade
PRMP - PSQ 70 MMCF/Decade

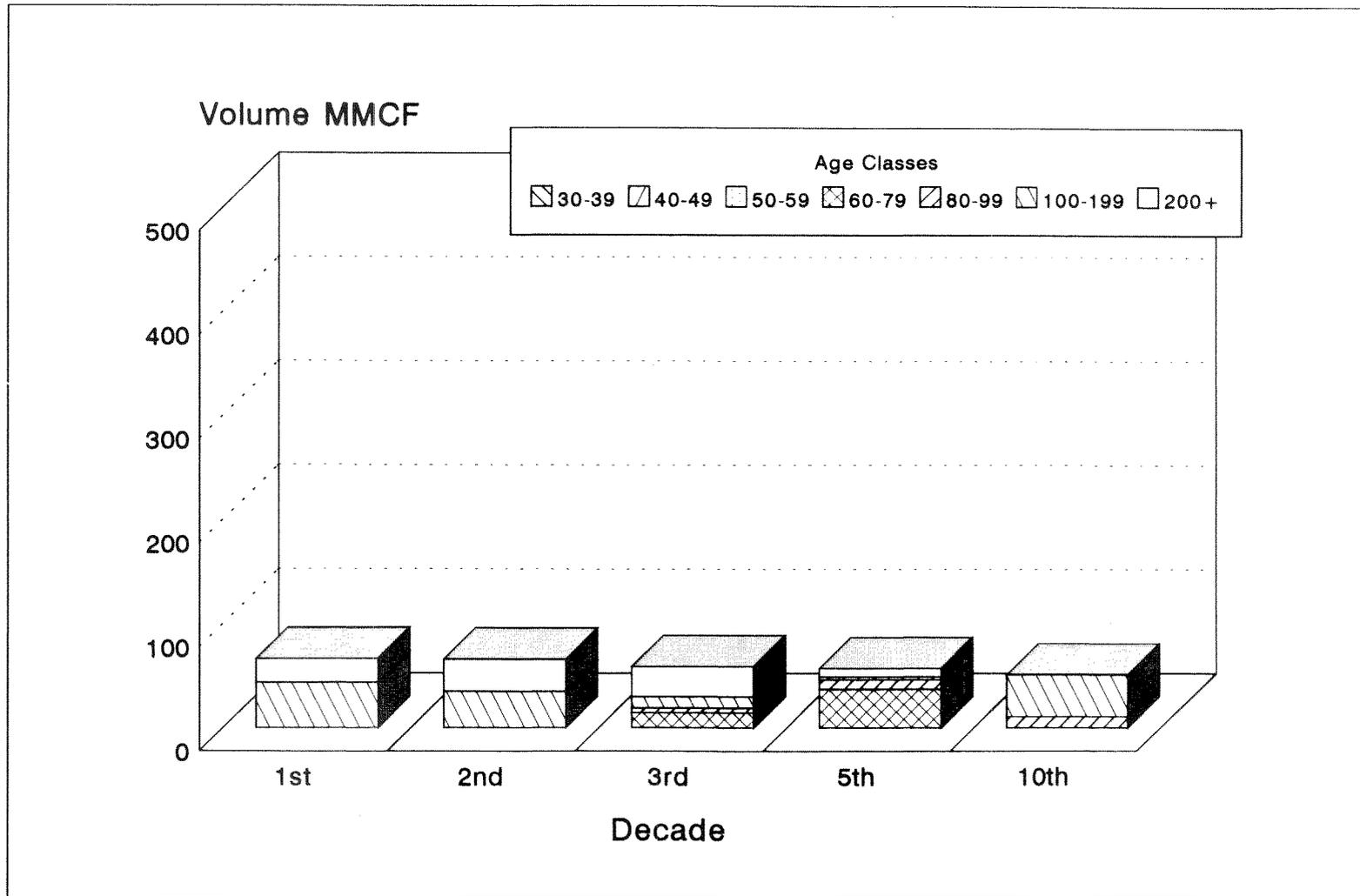


Figure HH-13. Regeneration Harvest Volume by Age Class and Decade. PRMP- PSQ 70 MMCF/Decade.

Figure HH-14. Regeneration Harvest Acreage by Age Class and Decade
PRMP - PSQ 70 MMCF/Decade

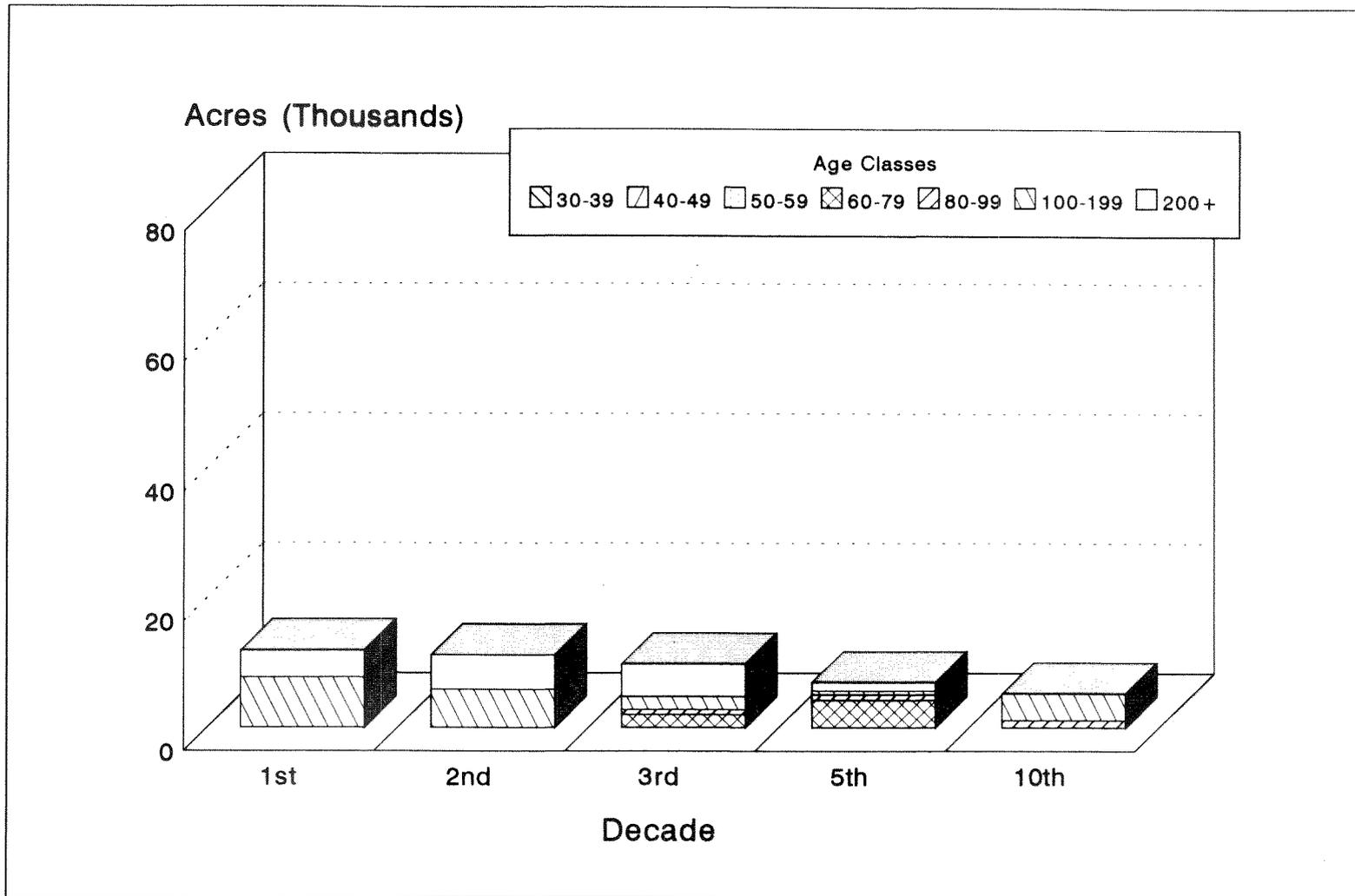


Figure HH-14. Regeneration Harvest Volume by Age Class and Decade. PRMP- PSQ 70 MMCF/Decade.

Appendix II

Average Acres Treated by Various Practices by Decade for Each Alternative

Table II-1. Average Acres Treated by Decade Under Alternative A

Practice	Acres By Decade				
	1st	2nd	3rd	5th	10th
Harvest					
Regeneration Harvest					
Even-aged	76,600	72,800	60,400	57,900	73,900
Low Retention	0	0	0	0	0
High Retention	0	0	0	0	0
Uneven-aged	0	0	0	0	0
Intermediate Harvest					
Commercial Thinning	1,700	2,900	3,600	11,200	0
Density Management	0	0	0	0	0
Site Preparation	33,700	33,600	33,000	32,900	3,400
Planting					
Normal Stock	54,100	1,700	1,400	1,400	1,800
Genetic Stock	34,700	85,600	71,000	68,100	86,900
Maintenance/Protection					
Plantation Release	7,400	7,300	6,000	5,800	7,400
Precommercial Thinning	53,100	57,400	54,600	44,200	44,200
Fertilization	62,300	51,700	134,800	195,100	182,500
Site Conversion	600	0	0	0	0

Table II-2. Average Acres by Decade Under Alternative B

Practice	Acres By Decade				
	1st	2nd	3rd	5th	10th
Harvest					
Regeneration Harvest					
Even-aged	67,400	62,100	52,400	54,200	62,900
Low Retention	0	0	0	0	0
High Retention	0	0	0	0	0
Uneven-aged	0	0	0	0	0
Intermediate Harvest					
Commercial Thinning	1,600	3,100	3,800	11,000	0
Density Management	0	0	0	0	0
Site Preparation	33,300	33,100	32,600	32,700	33,100
Planting					
Normal Stock	45,200	1,500	1,300	1,300	1,500
Genetic Stock	34,700	73,000	61,600	63,700	74,000
Maintenance/Protection					
Plantation Release	6,700	6,200	5,200	5,400	6,300
Precommercial Thinning	48,200	46,400	42,700	36,500	42,100
Fertilization	56,700	47,400	115,300	163,400	152,400
Site Conversion	500	0	0	0	0

Table II-3. Average Acres Treated by Decade Under Alternative C

Practice	Acres By Decade				
	1st	2nd	3rd	5th	10th
Harvest					
Regeneration Harvest					
Even-aged	0	0	0	0	0
Low Retention	13,400	11,800	10,000	1,400	4,500
High Retention	20,000	17,500	15,100	2,100	6,600
Uneven-aged	0	0	0	0	0
Intermediate Harvest					
Commercial Thinning	0	0	0	0	0
Density Management	0	0	1,100	40,200	1,200
Site Preparation	25,900	23,300	20,800	2,800	8,800
Planting					
Normal Stock	19,400	17,600	15,700	2,200	6,600
Genetic Stock	19,400	17,600	15,700	2,200	6,600
Maintenance/Protection					
Plantation Release	3,200	2,900	2,600	400	1,100
Precommercial Thinning	40,200	23,500	20,600	7,600	6,700
Fertilization	47,300	40,400	45,500	45,500	0
Site Conversion	400	0	0	0	0

Table II-4. Average Acres Treated by Decade Under Alternative D

Practice	Acres By Decade				
	1st	2nd	3rd	5th	10th
Harvest					
Regeneration Harvest					
Even-aged	18,900	20,500	22,700	32,700	30,000
Low Retention	0	0	0	0	0
High Retention	0	0	0	0	0
Uneven-aged	0	0	0	0	0
Intermediate Harvest					
Commercial Thinning	1,000*	1,000*	1,000*	1,000*	1,000*
Density Management	0	0	0	0	0
Site Preparation	15,100	16,400	18,100	26,000	24,000
Planting					
Normal Stock	9,300	500	500	800	700
Genetic Stock	13,300	24,000	27,000	38,500	35,300
Maintenance/Protection					
Plantation Release	1,900	2,000	2,300	3,300	3,000
Precommercial Thinning	30,900	8,800	9,600	12,900	13,800
Fertilization	36,300	32,200	48,000	62,200	53,900
Site Conversion	300	0	0	0	0

*Minimum available estimate

Table II-5. Average Acres Treated by Decade Under Alternative E

Practice	Acres By Decade				
	1st	2nd	3rd	5th	10th
Harvest					
Regeneration Harvest					
Even-aged	6,700	6,600	7,500	6,700	5,700
Low Retention	0	0	0	0	0
High Retention	0	0	0	0	0
Uneven-aged	0	0	0	0	0
Intermediate Harvest					
Commercial Thinning	100	0	0	1100	300
Density Management	0	0	0	0	0
Site Preparation	5,400	5,300	5,900	5,400	4,600
Planting					
Normal Stock	1,600	200	200	200	100
Genetic Stock	6,400	7,800	8,800	7,900	6,700
Maintenance/Protection					
Plantation Release	700	700	800	700	600
Precommerical Thinning	7,100	1,100	1,100	1,200	1,000
Fertilization	8,288	11,400	14,300	15,900	4,500
Site Conversion	100	0	0	0	0

Table II-6. Average Acres Treated by Decade Under Alternative PRMP

Practice	Acres By Decade				
	1st	2nd	3rd	5th	10th
Harvest					
Regeneration Harvest					
GFMA	9,960	9,290	7,910	4,240	3,200
Connectivity	1,920	1,900	1,900	2,220	1,920
Intermediate Harvest					
Commercial Thinning	840	980	1,160	2,040	7,520
Density Management	660	760	2,870	3,010	110
Site Preparation	8,910	8,400	7,360	4,850	3,880
Planting					
Normal Stock	2,850	1,340	1,180	780	620
Genetic Stock	11,400	12,090	10,590	6,980	5,590
Maintenance/Protection					
Plantation Release	1,190	1,120	980	650	520
Precommerical Thinning	37,790	6,720	5,890	3,880	3,110
Fertilization	14,400	9,000	5,580	10,070	5,820
Site Conversion	500	0	0	0	0
Pruning	4,600	13,600	2,420	1,140	1,400

*Final Preferred Alternative first decade estimate expected to be about 5,100 acres. Additional field survey and analysis pending.

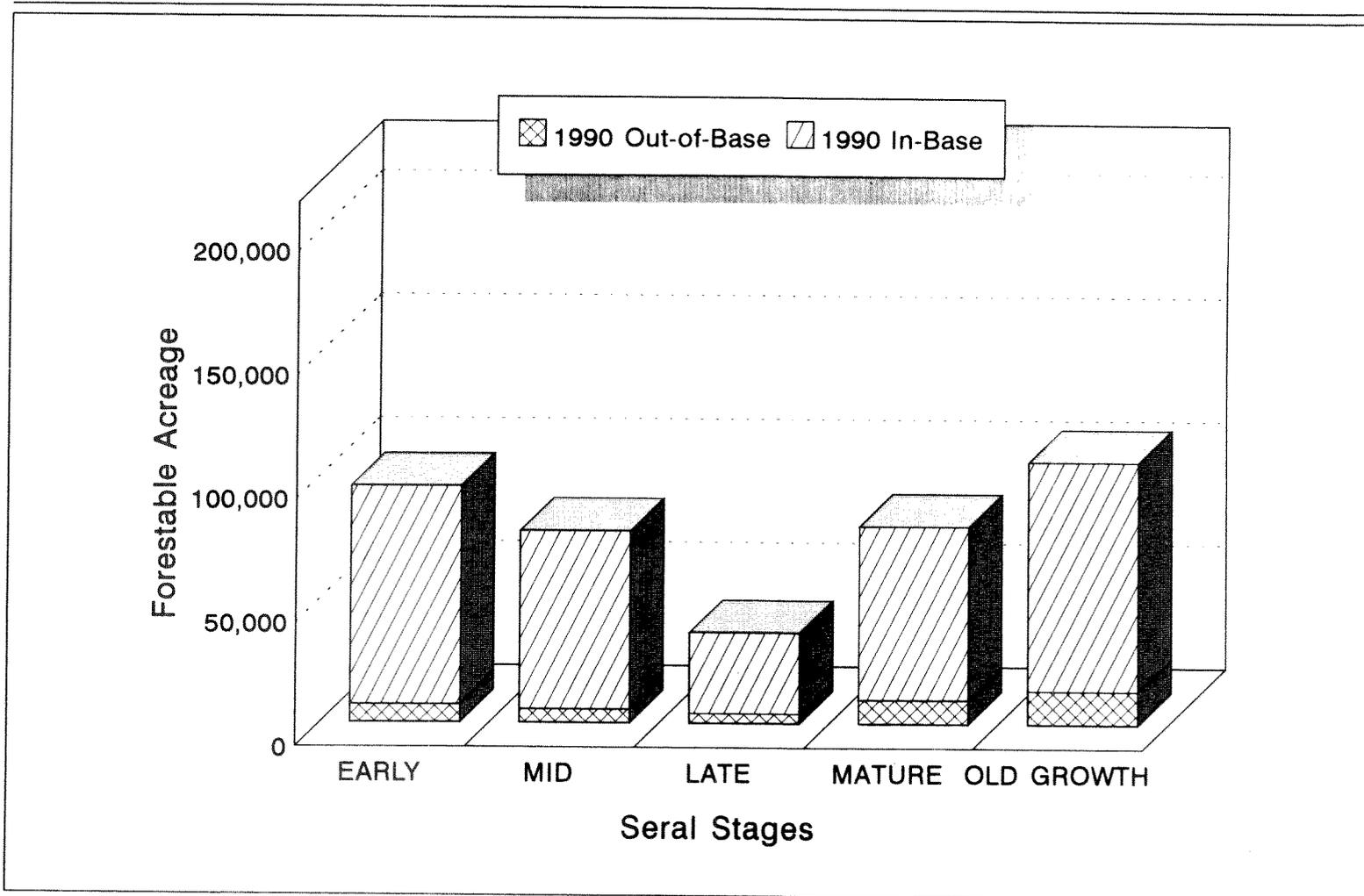
Appendix JJ

Summary Effect of Land Use Allocations on Lands Available for Timber Production

Percent of Forest Acres Available for Timber Production							
Alternative	Suitable Woodlands	Suitable Commercial Forestland			Special Management ¹ Areas or Reserves		Total Acreage
		Intensive Acreage	Restricted Acreage	Percent	Acreage	Percent	
NA	n/a	331,600	35,900	91.4	34,400	8.6	401,900
A	2,900	353,300	0	89.3	39,400	10.0	395,600
B	2,600	318,900	2,400	81.2	71,600	18.1	395,500
C	100	0	270,200	68.3	125,300	31.7	395,600
B	0	159,300	47,900	52.4	188,400	47.6	395,600
E	0	23,800	23,400	12.0	348,200	88.0	395,500
PRMP	0	61,200	28,700	22.7	305,500	77.3	395,400

¹Areas not managed for timber production.

Figure KK-1. 1990 Seral Stages by ASQ Base Allocation
Alternative A



Seral Stages of Base Allocations
 Appendix KK

Figure KK-1. 1990 Seral Stages by ASQ Base Allocation. Alternative A.

Figure KK-2. 2000 Seral Stages by ASQ Base Allocation Alternative A

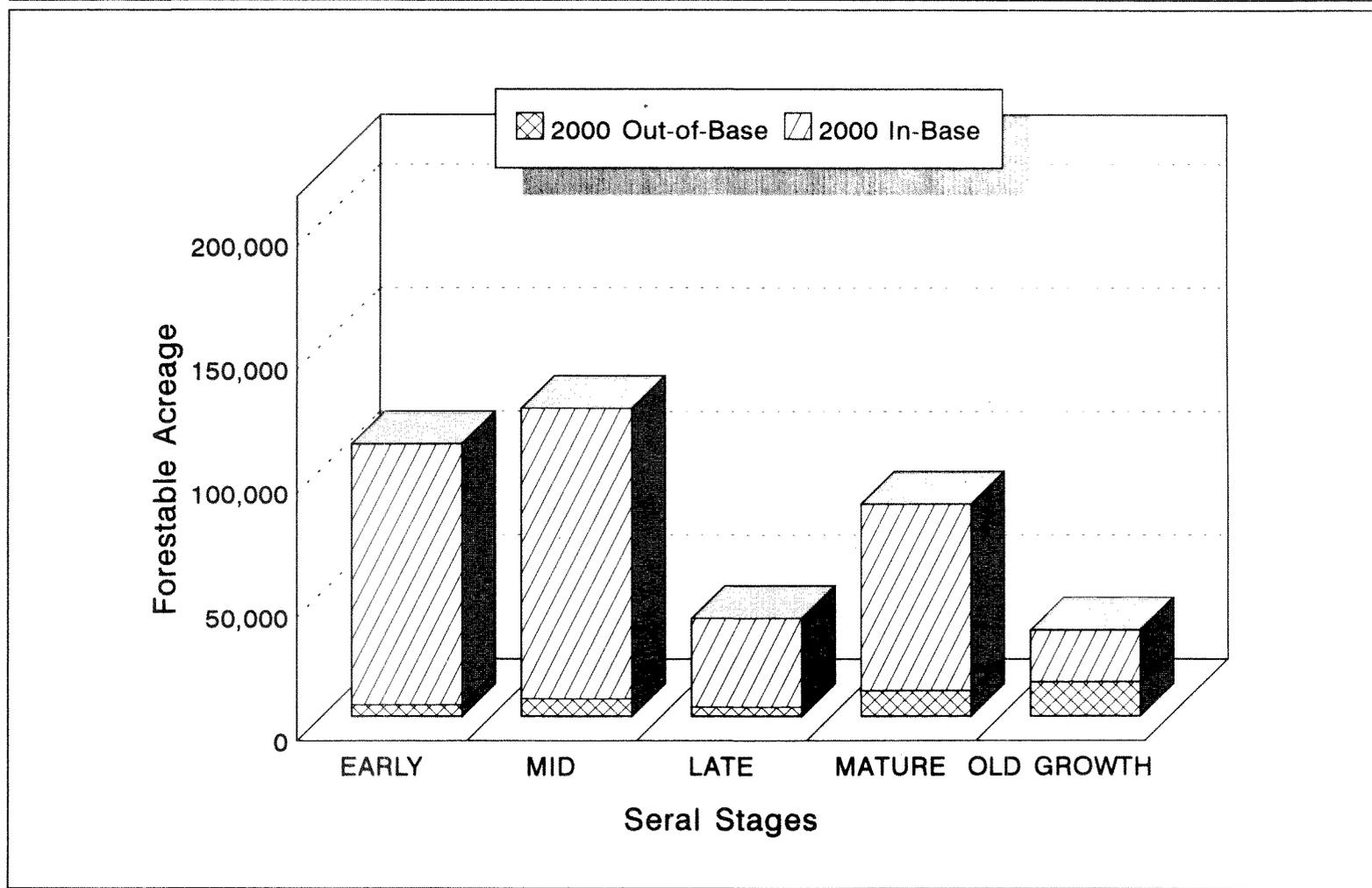


Figure KK-2. 2000 Seral Stages by ASQ Base Allocation. Alternative A.

Figure KK-3. 2090 Seral Stages by ASQ Base Allocation
Alternative A

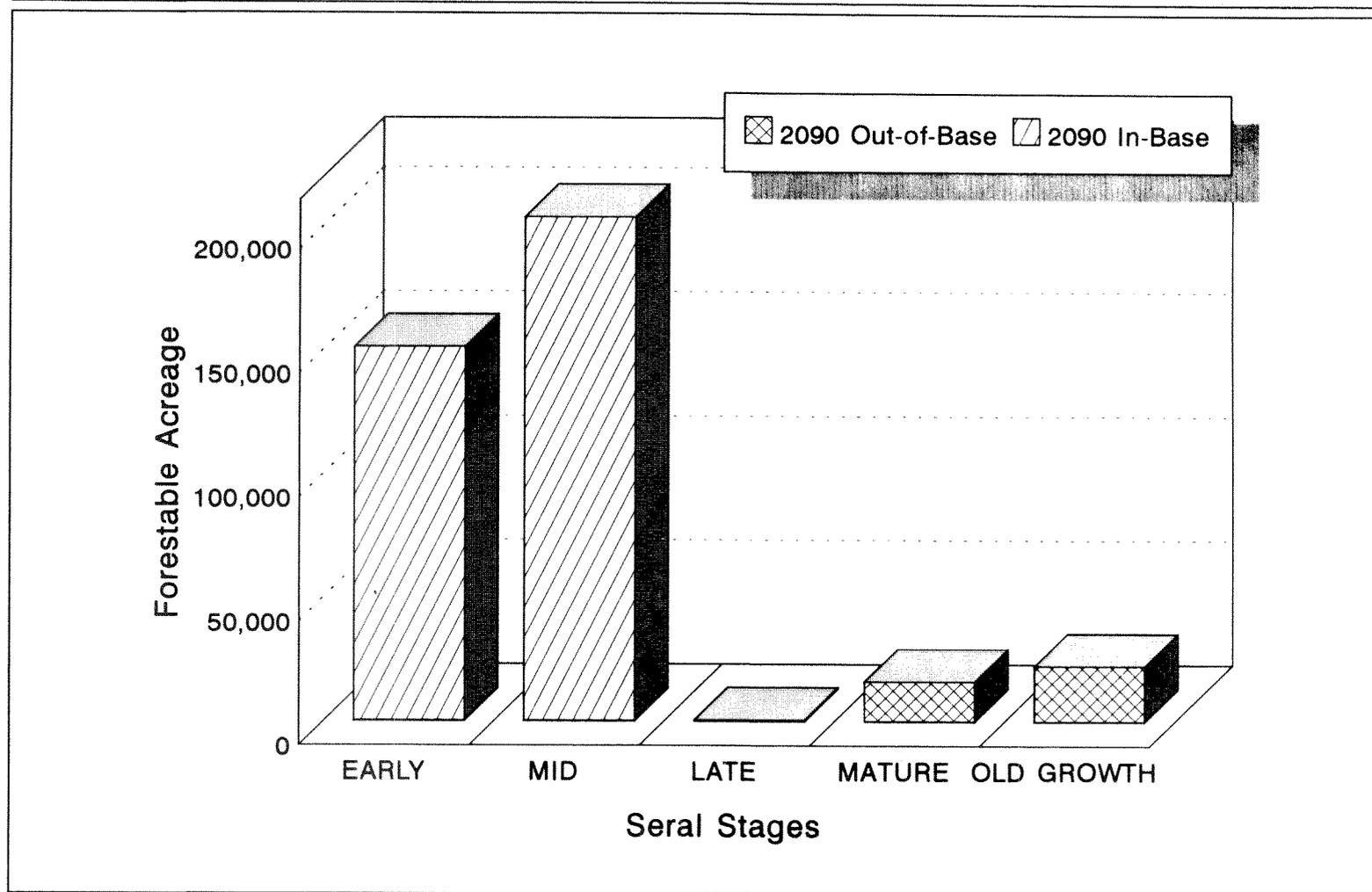


Figure KK-3. 2090 Seral Stages by ASQ Base Allocation. Alternative A.

Figure KK-4. 1990 Seral Stages by ASQ Base Allocation Alternative B

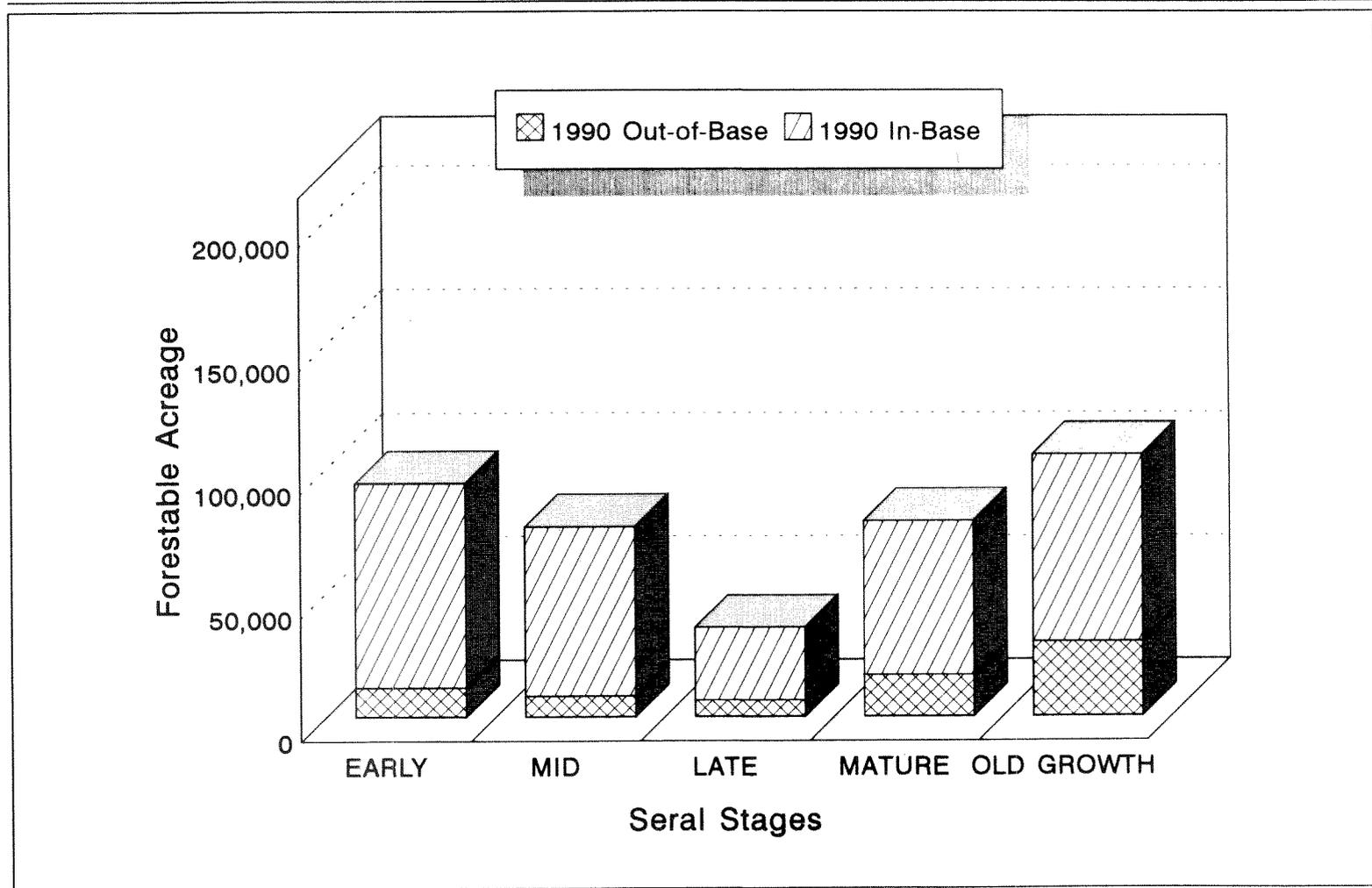


Figure KK-4. 1990 Seral Stages by ASQ Base Allocation. Alternative B.

Figure KK-5. 2000 Seral Stages by ASQ Base Allocation
Alternative B

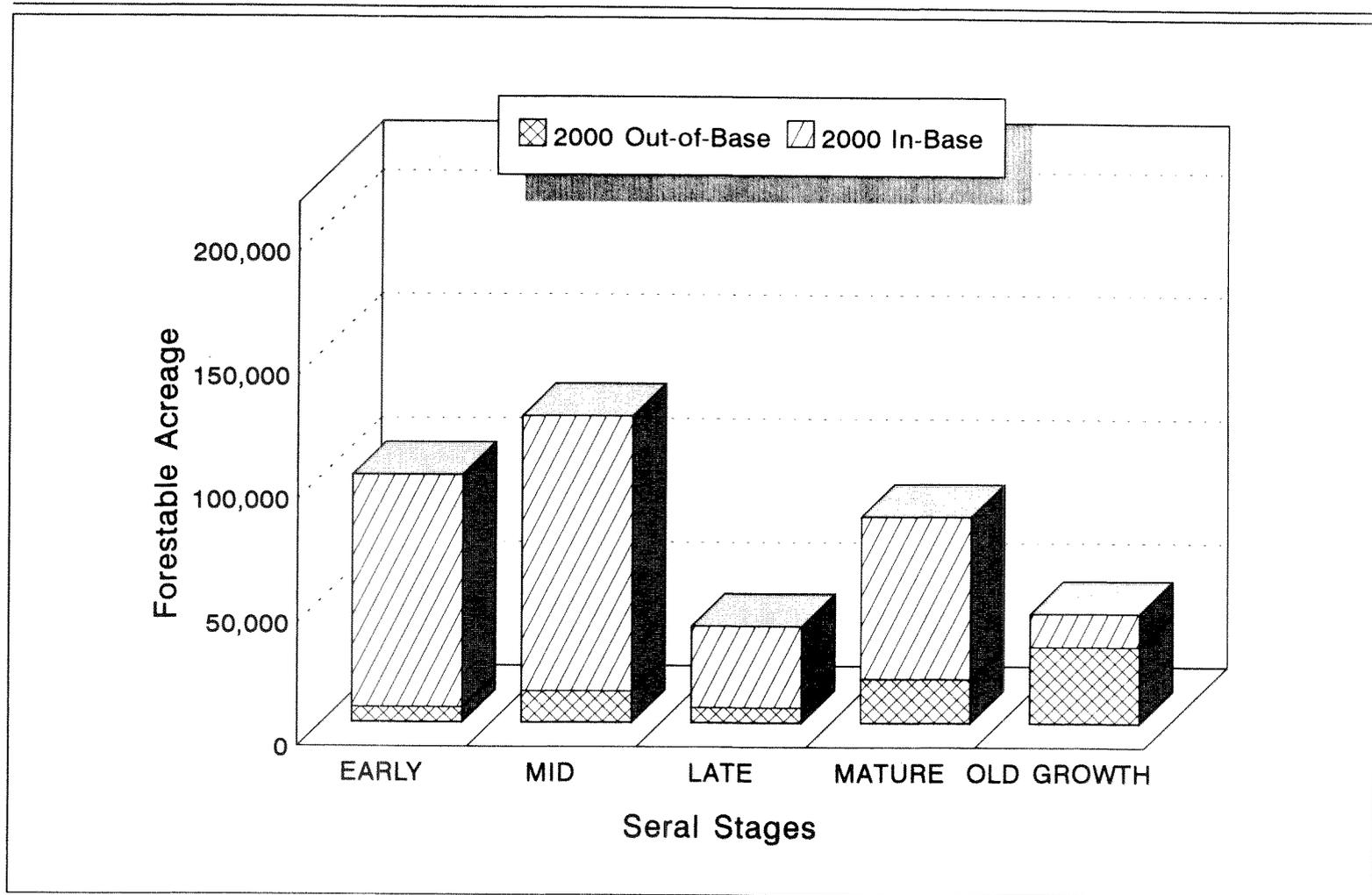


Figure KK-5. 2000 Seral Stages by ASQ Base Allocation. Alternative B.

Figure KK-6. 2090 Seral Stages by ASQ Base Allocation Alternative B

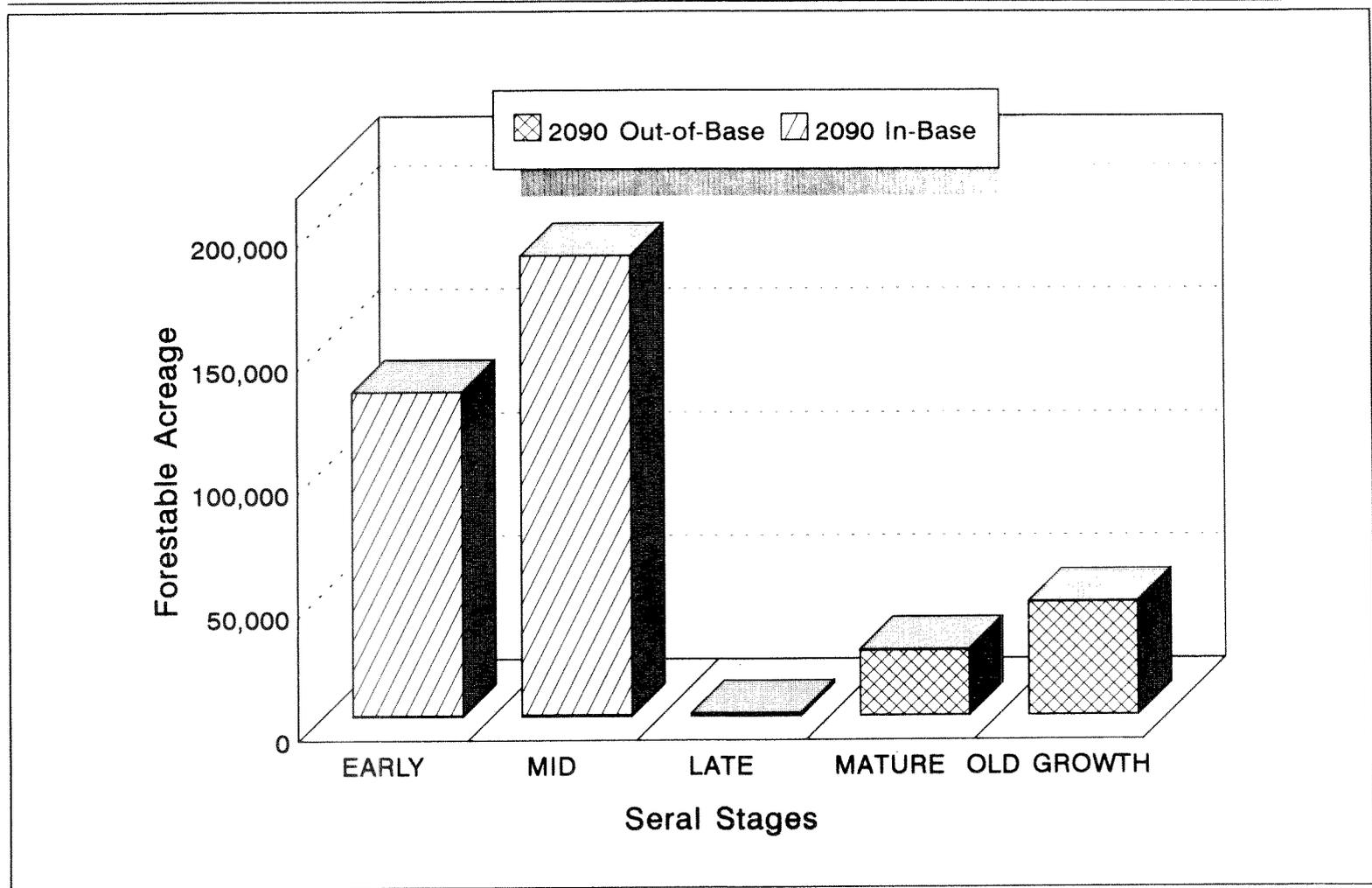


Figure KK-6. 2090 Seral Stages by ASQ Base Allocation. Alternative B.

Figure KK-7. 1990 Seral Stages by ASQ Base Allocation
Alternative C

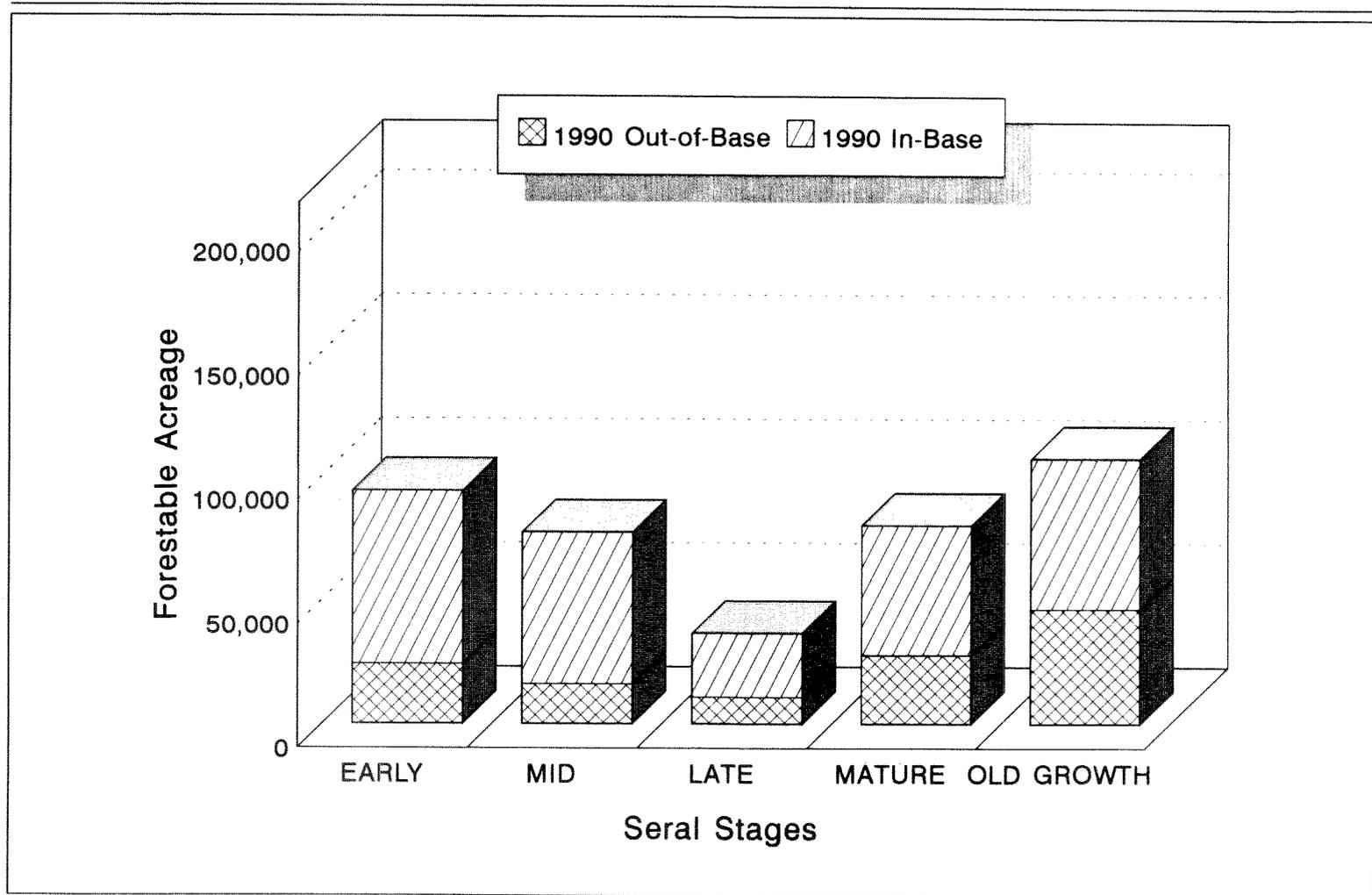


Figure KK-7. 1990 Seral Stages by ASQ Base Allocation. Alternative C.

Figure KK-8. 2000 Seral Stages by ASQ Base Allocation Alternative C

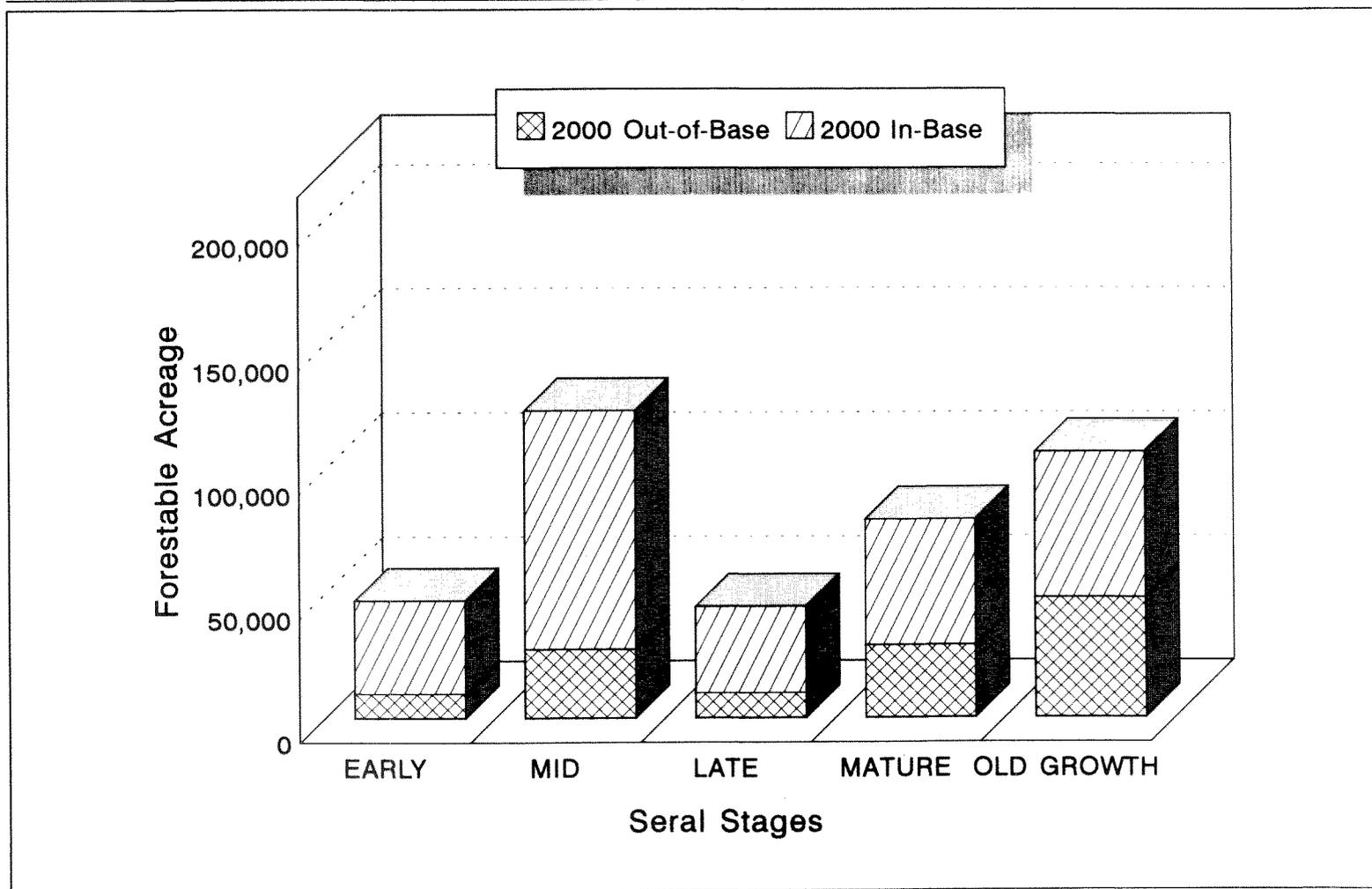


Figure KK-8. 2000 Seral Stages by ASQ Base Allocation. Alternative C.

Figure KK-9. 2090 Seral Stages by ASQ Base Allocation
Alternative C

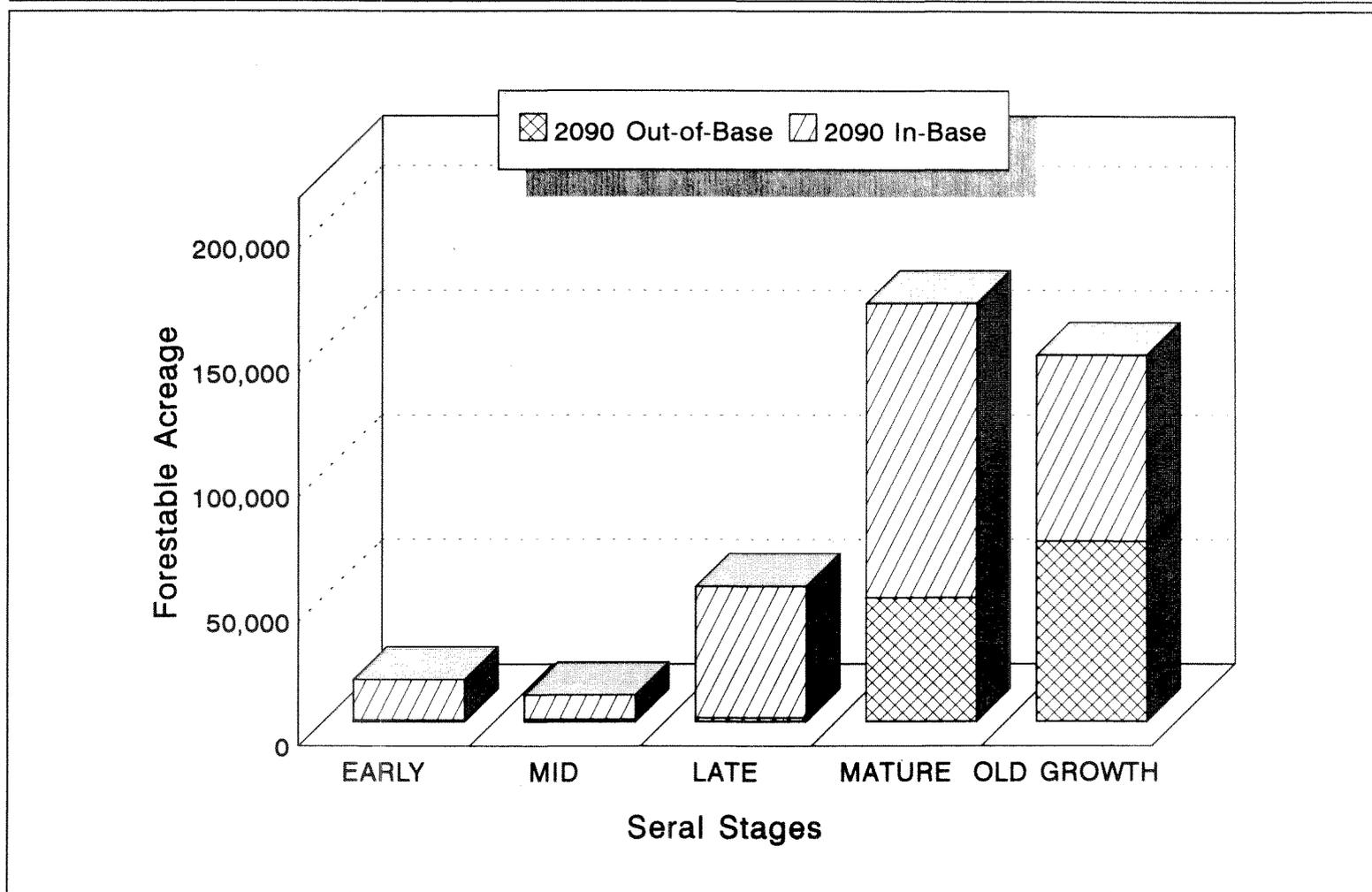


Figure KK-9. 2090 Seral Stages by ASQ Base Allocation. Alternative C.

Figure KK-10. 1990 Seral Stages by ASQ Base Allocation Alternative D

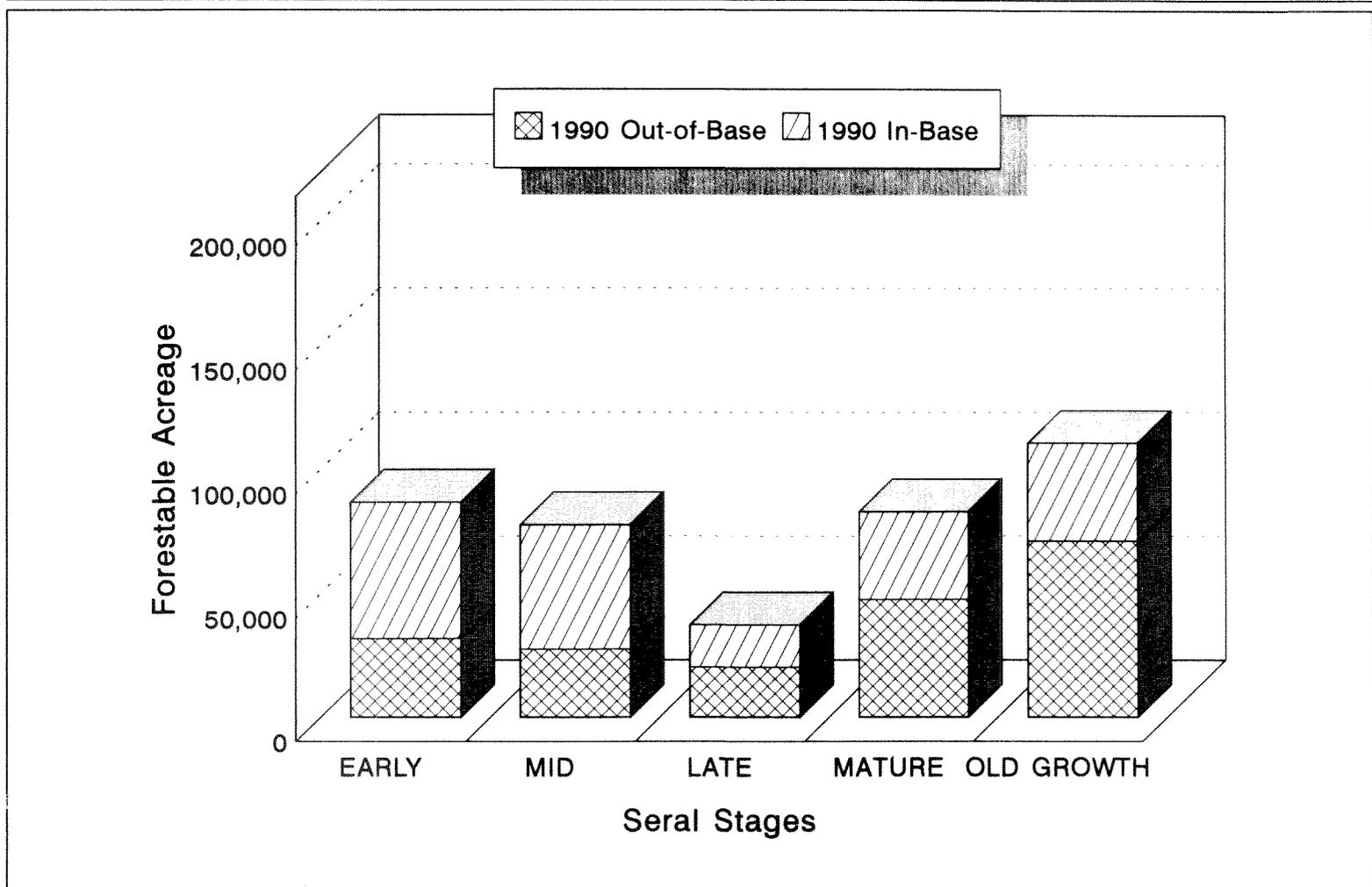


Figure KK-10. 1990 Seral Stages by ASQ Base Allocation. Alternative D.

Figure KK-11. 2000 Seral Stages by ASQ Base Allocation
Alternative D

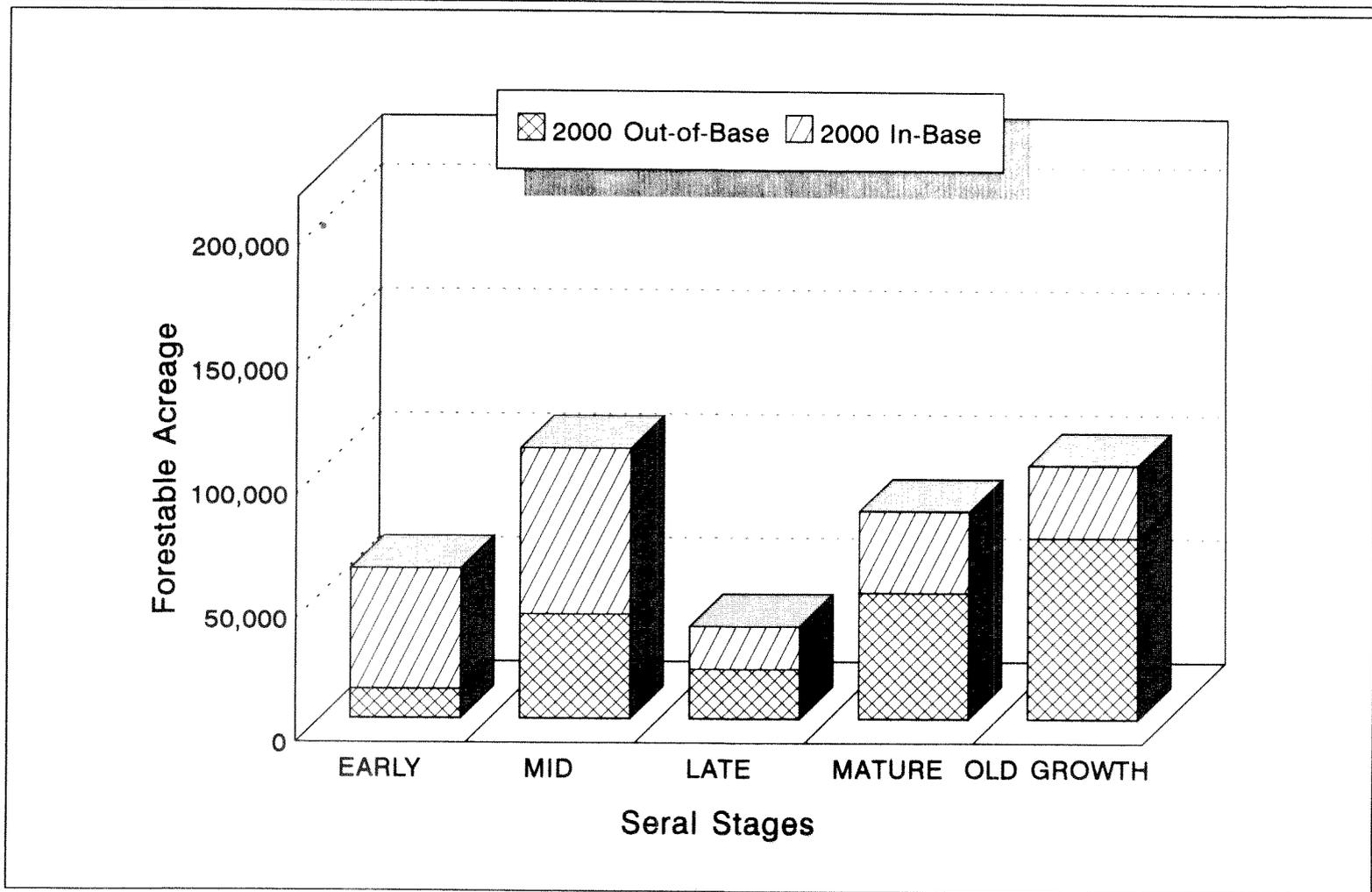


Figure KK-11. 2000 Seral Stages by ASQ Base Allocation. Alternative D.

Figure KK-12. 2090 Seral Stages by ASQ Base Allocation Alternative D

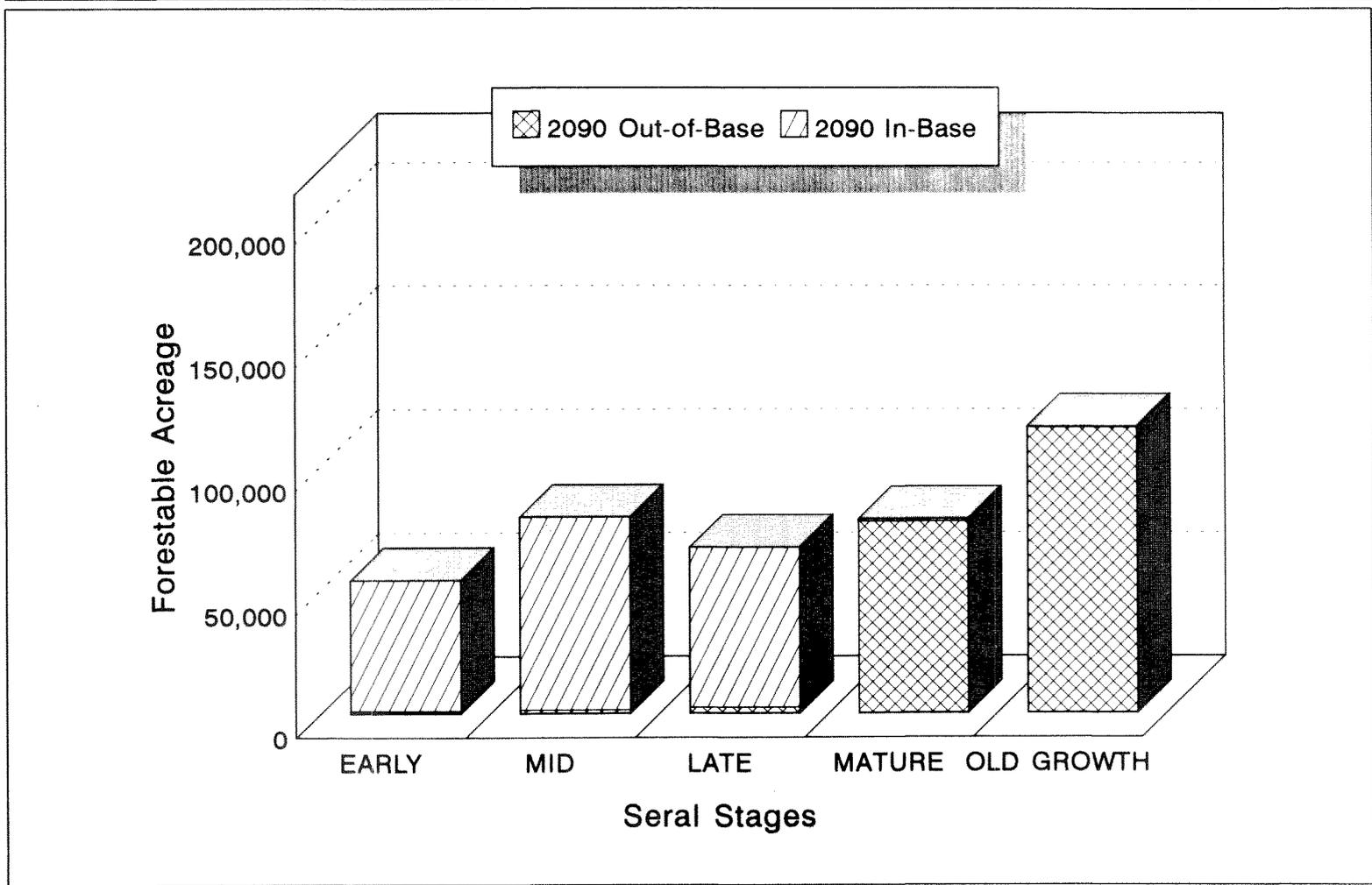


Figure KK-12. 2090 Seral Stages by ASQ Base Allocation. Alternative D.

Figure KK-13. 1990 Seral Stages by ASQ Base Allocation Alternative E

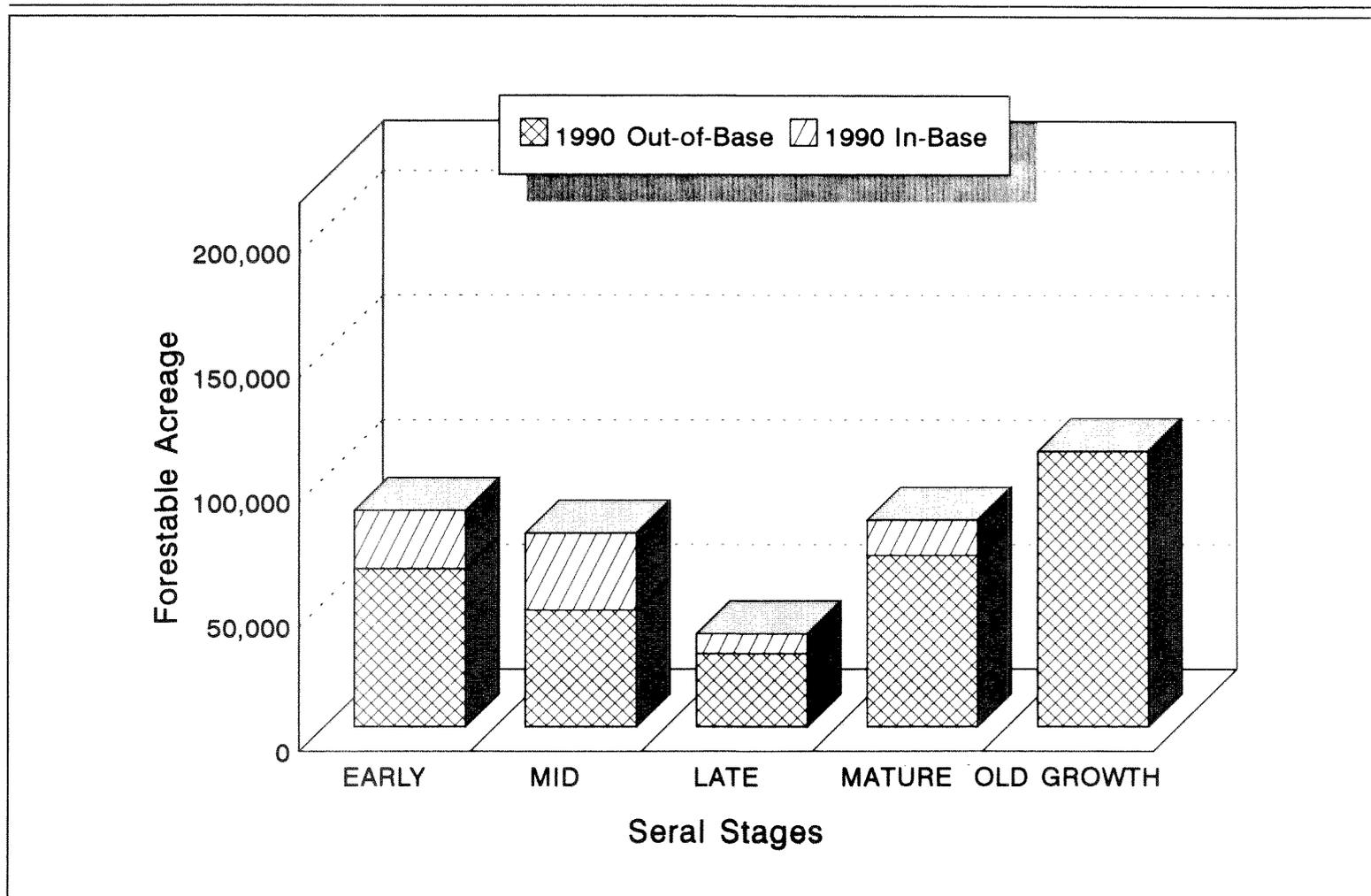


Figure KK-13. 1990 Seral Stages by ASQ Base Allocation. Alternative E.

Figure KK-14. 2000 Seral Stages by ASQ Base Allocation
Alternative E

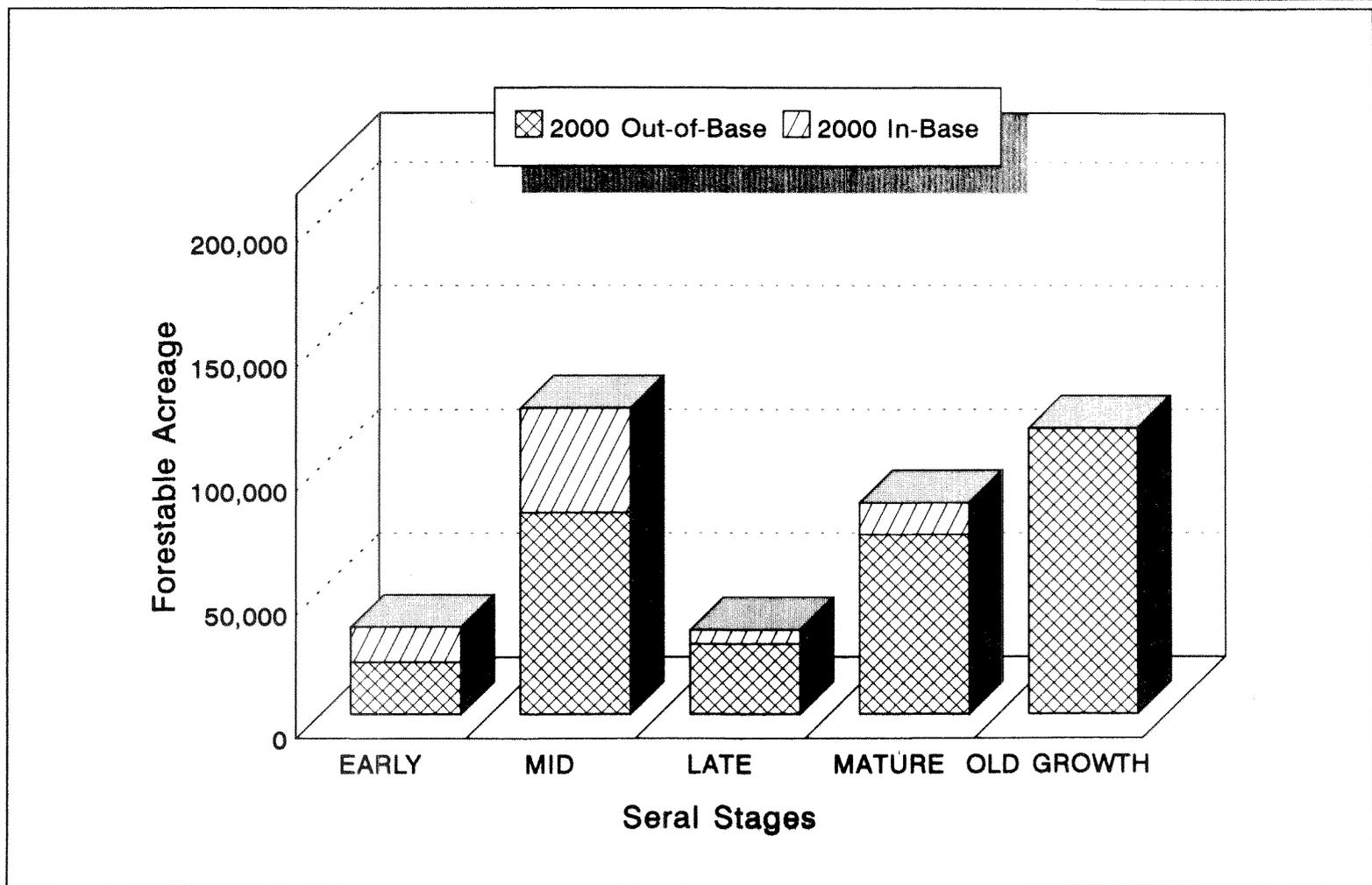


Figure KK-14. 2000 Seral Stages by ASQ Base Allocation. Alternative E.

Figure KK-15. 2090 Seral Stages by ASQ Base Allocation Alternative E

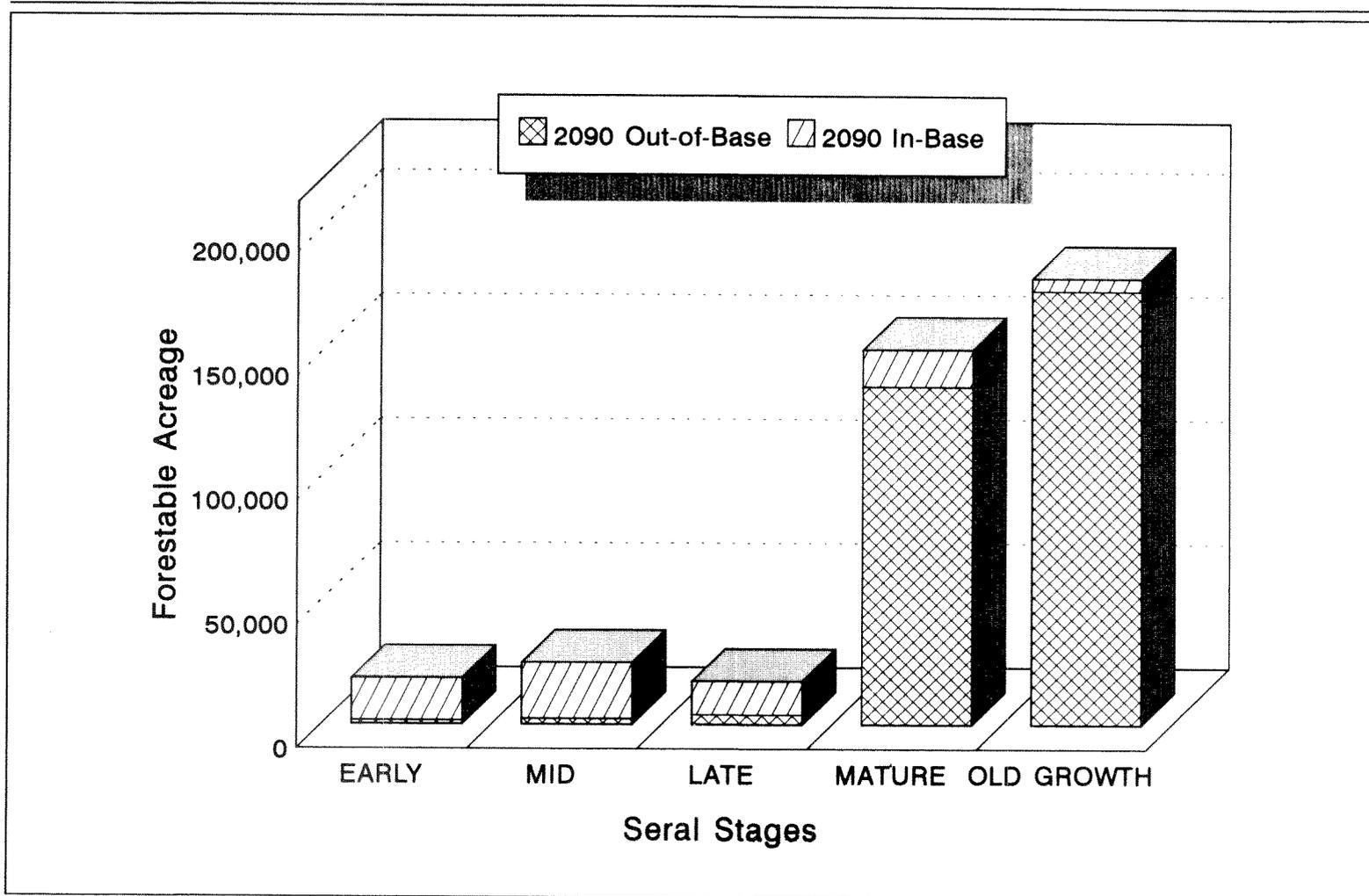


Figure KK-15. 2090 Seral Stages by ASQ Base Allocation. Alternative E.

Figure KK-16. 1992 Seral Stages by PSQ Base Allocation
PRMP

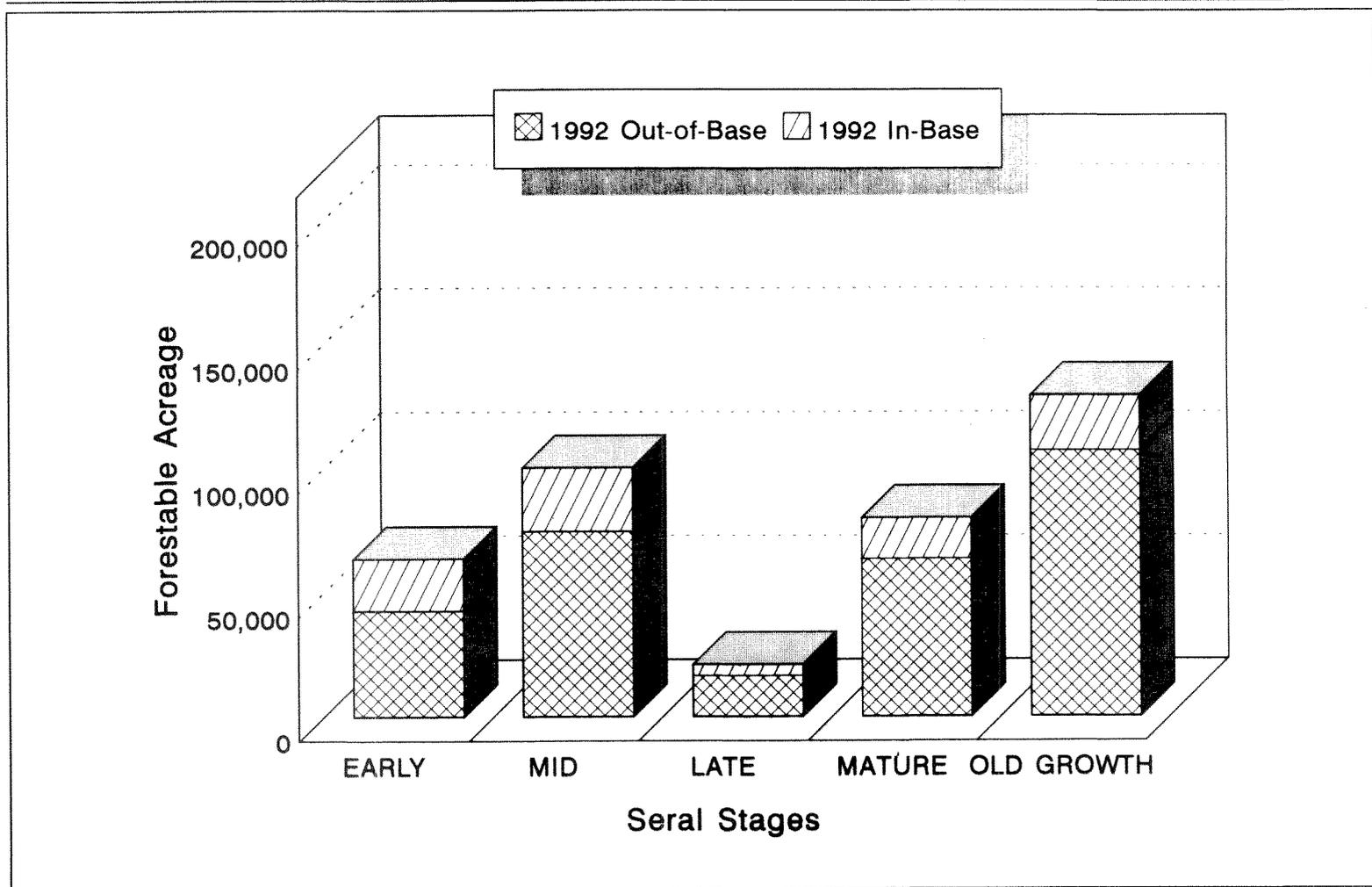


Figure KK-16. 1992 Seral Stages by PSQ Base Allocation. PRMP.

Figure KK-17. 2002 Seral Stages by PSQ Base Allocation
PRMP

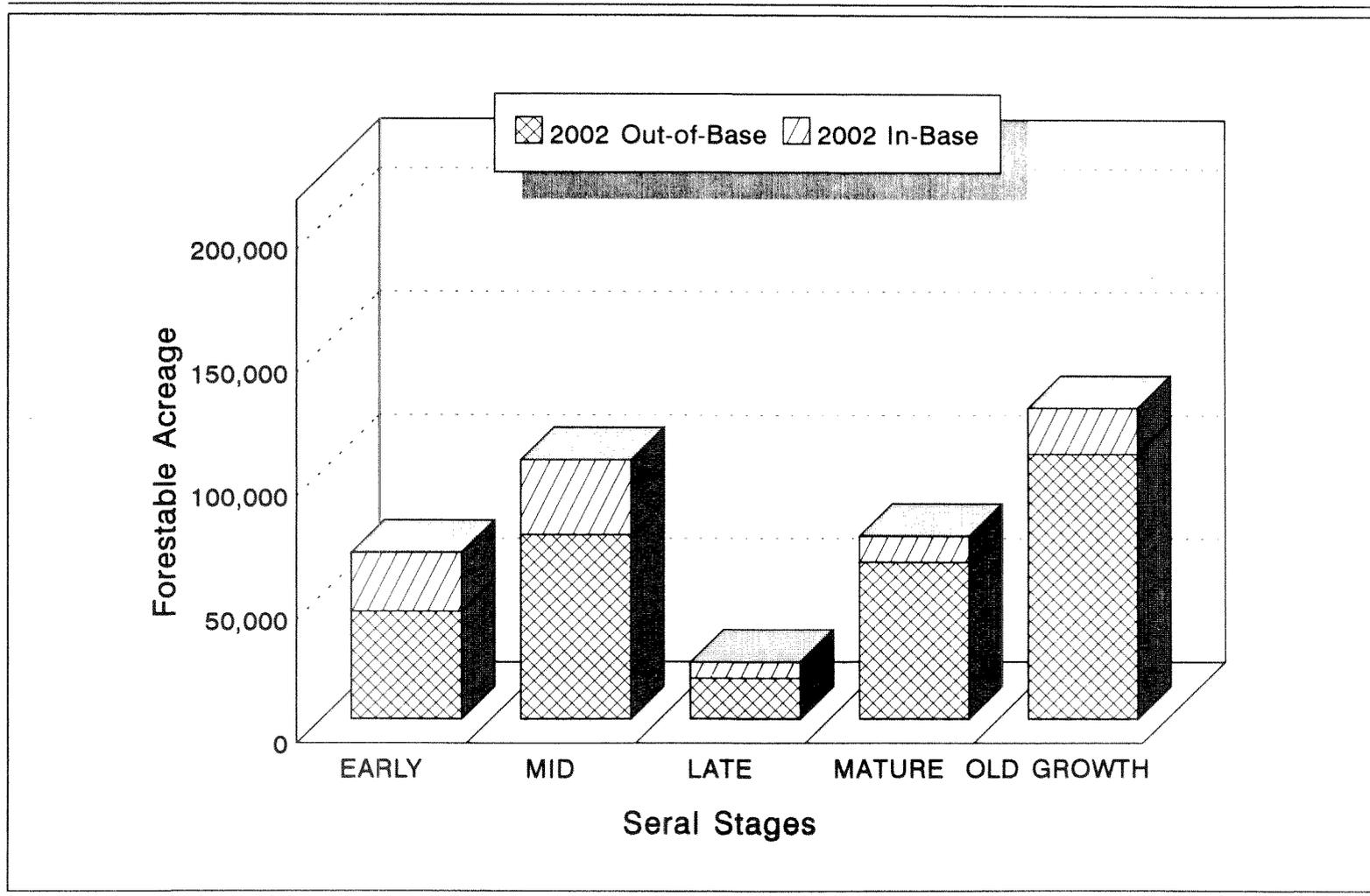


Figure KK-17. 2002 Seral Stages by PSQ Base Allocation. PRMP.

Figure KK-18. 2092 Seral Stages by PSQ Base Allocation
PRMP

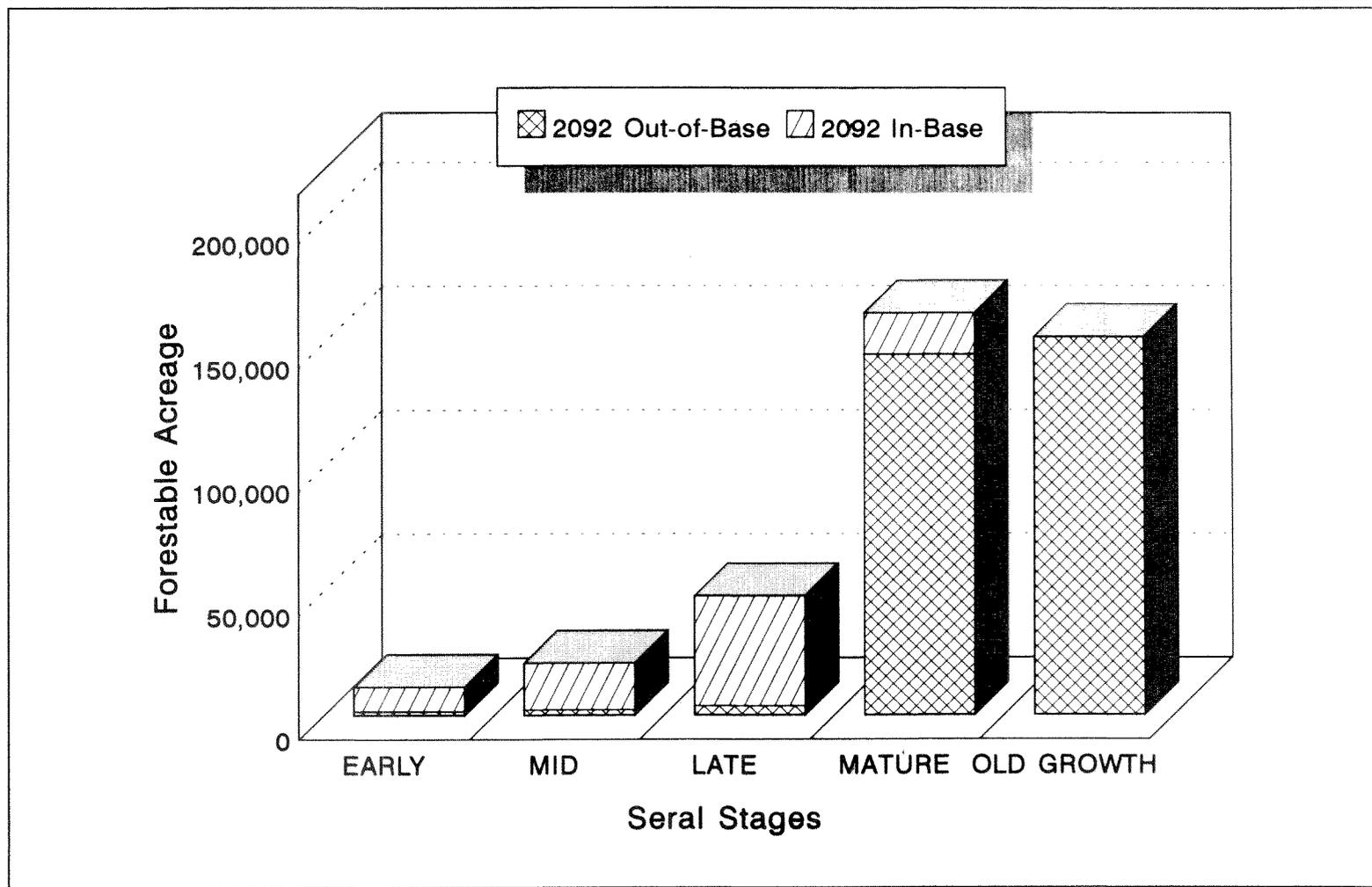


Figure KK-18. 2092 Seral Stages by PSQ Base Allocation. PRMP.

Appendix LL

Consistency of the Proposed RMP with State of Oregon Wildlife Plans

Consistency of the Proposed RMP with State of Oregon Wildlife Plans

State Plan/Statute	Objective	Consistency of Proposed RMP
Oregon Statutory Wildlife Policy, Revised Statute 496.012	Maintain all species of wildlife at optimum levels and prevent the serious depletions of any indigenous species.	May maintain some populations at less than optimum (see later discussion of big game management objectives and Effects on Wildlife.)
	Develop and manage the lands and waters of the State in a manner that will enhance the production and public enjoyment of wildlife.	Public access would be limited by access management.
	Develop and maintain public access to the lands and waters of the State and the wildlife resources thereon.	
	Regulate wildlife populations and public enjoyment of wildlife in a manner that is compatible with primary uses of the lands and waters of the State and provide optimum public recreational benefits.	
Oregon Threatened and Endangered Species Act	Protect and conserve wildlife species that are determined to be threatened or endangered.	All State listed species found within Roseburg District are also Federally listed under the Endangered Species Act. As such, these species will be protected under the requirements and provisions of the Act.
Oregon's Sensitive Species Rule	Help prevent species from qualifying for listing as threatened or endangered.	Species on Oregon's sensitive species list would be protected well. Also see later discussions of wild fish policy and fish plans.
Nongame Wildlife Plan	Maintain populations of naturally occurring Oregon nongame wildlife at self sustaining levels within natural geographic ranges in a manner that provides for optimum recreational, scientific, and cultural benefits and, where possible, is consistent with primary uses of lands and waters of the State.	See preceding discussions.

Consistency of the Proposed RMP with State of Oregon Wildlife Plans (continued)

State Plan/Statute	Objective	Consistency of Proposed RMP
Big Game Population Management Objectives	Develop, restore and/or maintain big game (along with associated recreation, aesthetic and commercial opportunities and benefits) at the level identified in 1980 as the planning target level by game management unit. This is accomplished through hunting season regulation and management practices on public lands that tend to stabilize the cover-forage relationship in space and time, provide for a wildlife emphasis in management of sensitive wintering areas, and offer habitat improvement opportunities.	Forage on BLM administered lands would decline. Private lands, however, are expected to provide adequate forage. Access management would improve habitat for elk. Wild Fish Policy - Protect and enhance wild stocks. Would not change habitat conditions enough in the short-term to alter existing stocks. In the long-term, would protect streams sufficiently to protect wild stocks and provide sufficient stream habitat protection to contribute to their enhancement.
Coho, Steelhead, and Trout Plans	Maintain and enhance production.	Similar to wild stocks. See preceding.
Basin Fish Management Plans	Establish compatible objectives for management of all fish stocks in each Basin.	Similar to wild stocks. See preceding.
Oregon Forest Practices Act Rules	Establish minimum standards which encourage and enhance the growing and harvesting of trees while considering and protecting other environmental resources such as air, water, soil, and wildlife.	See Appendix MM.

Appendix MM

Consistency of the Proposed RMP with the Forestry Program for Oregon (FPFO)

FPFO Objective	Consistency of the Proposed RMP
<p>1. Forest Land Use. Preserve the forest land base of Oregon: Stabilize the present commercial forest land base. Manage habitat based on sound research data and the recognition that forests are dynamic and most forest uses are compatible over time.</p>	<p>Preserves most of the forest land administered by BLM, while allowing for some conversion of forest to accommodate expansion of transportation, power and communication facilities. Also allows for exchange and/or sale of some forest lands, which could lead to their conversion to nonforest uses if local land-use plans permit. Land that would be managed for commercial forest products totals 89,900 acres, less than the 395,400 acres currently allocated to commercial forest production. The allocation of additional land to uses other than timber production is based on current research data.</p>
<p>2. Forest Practices. Assure practical forest practices that conserve and protect soil productivity and air and water quality: Promote forest practices that maintain Oregon's forest values, including forest tree species, fish and wildlife, soil productivity, and air and water quality. The Forest Practices Act and rules are one vehicle for accomplishing this.</p>	<p>Provides for the use of practical forest practices that meet this goal and meet or exceed the requirements of the Oregon Forest Practices Act and rules of the Oregon Smoke Management Plan, with two possible exceptions:</p> <p>(1) possible inconsistency with the clear cut size and proximity requirement of Section 4 of the Forest Practices Act as revised in 1991. Recent interpretations of that requirement indicate that, for its purposes, "clear cuts" include most shelterwood harvest units so they would also include harvest units with retention of 6 to 8 green trees per acre and even with 12 to 18 per acre. Although BLM harvest units will be fragmented by Riparian Reserves, the 300-foot distance (from adjacent units) requirement in the Act would not cover all units on both sides of intermittent streams; thus, the 120-acre limit might be violated, though the Proposed Plan seems consistent with the Forest Practices Act objective.</p> <p>(2) The requirement for smoke management clearance prior to burning slash and need for completion of burning before replanting, may cause delay in reforestation beyond the one year required by the Act.</p>

Consistency of the PRMP with the FPFO (continued)

FPFO Objective	Consistency of the Proposed RMP
<p>3. Timber Growth and Harvest. Promote the maximum level of sustainable timber growth and harvest on all forest lands available for timber production, consistent with applicable laws and regulations and taking into consideration landowner objectives.</p>	<p>Provides for the use of intensive forest management practices that are professionally and environmentally sound, to promote timber growth and harvest on all forest lands allocated as available for such intensive management, consistent with the Plan's goals and objectives.</p>
<p>4. Recreation, Fish and Wildlife, Grazing and Other Forest Uses. Encourage appropriate opportunities for other forest uses, such as fish and wildlife habitat, grazing, recreation and scenic values on all forest lands, consistent with landowner objectives: A full range of recreation opportunities is encouraged. Where needed to reduce harassment and/or over harvest of wildlife, road closure programs are supported.</p>	<p>Provides opportunities for other forest uses, consistent with the plan's goals and objectives. Road closures to protect wildlife habitat and other values are emphasized.</p>
<p>5. Forest Protection. Devise and use environmentally sound and economically efficient strategies to protect Oregon's forests from wildfire, insects, disease and other damaging agents: Use integrated pest management. Minimize total cost plus loss resulting from wildfire. Employ cost-effective fire management policies that emphasize planned ignition fires over natural ignition fires and that consider impacts to the state's forest fire protection program.</p>	<p>Economically efficient protection strategies would be employed, and integrated pest management would be used. Minimizing total cost plus loss from wildfire would be integral. Planned-ignition prescribed fires would be emphasized over natural-ignition prescribed fires, but the latter could be used to achieve resource and fire management objectives. Cooperation with other fire suppression agencies, including state and local agencies, would help assure cost-effective fire protection and suppression by all parties.</p>

Appendix NN

Relationship of the Proposed Resource Management Plan to Statewide Planning Goals

Statewide Goal Number and Description	Consistency of Proposed Resource Management Plan
<p>1. Citizen Involvement - To develop a citizen involvement program that ensures the opportunity for citizens to be involved in all phases of the planning process. Federal and other agencies shall coordinate their planning efforts with the affected government bodies and make use of existing local citizen involvement programs established by cities and counties.</p>	<p>BLM's land use planning process provides for public input at various stages. Public input was specifically requested in developing issues, planning criteria, and the proposed resource management plan. Coordination with affected government bodies, including the governor's forest planning team, has been ongoing and will continue. BLM has used county planning departments to provide linkage to local citizen involvement programs.</p>
<p>2. Land Use Planning - To establish a land use planning process and policy framework as a basis for all decisions and actions related to use of land and to assure an adequate factual base for such decisions and actions.</p>	<p>The proposed resource management plan has been developed in accordance with the land use planning process authorized by the Federal Land Policy and Management Act of 1976, which provides a policy framework for all decisions and actions. The process includes issue identification, inventories, and evaluation of alternative choices of action. Intergovernmental coordination in the planning process is discussed in Chapter 5 of the resource management plan/ environmental impact statement.</p>
<p>3. Agricultural Lands - To preserve and maintain existing commercial agricultural lands for farm use, consistent with existing and future needs for agricultural products, forest, and open space.</p>	<p>The proposed resource management plan does not exclude BLM-administered grazing land from grazing use or affect the use of other lands for agriculture use.</p>
<p>4. Forest Lands - To conserve forestlands by maintaining the forest land base and to protect the state's forest economy by making possible economically efficient forest practices that assure the continuous growing and harvesting of forest tree species as the leading use on forest land consistent with the sound management of soil, air, water, and fish and wildlife resources and provision for recreational opportunities and agriculture.</p>	<p>BLM-administered lands in the planning area are predominately forestland and woodlands. The proposed resource management plan would not lead to substantial conversion of those lands to nonforest uses. Conversion areas such as new forest roads and utility rights-of-way would be limited to the minimum width necessary for management and safety, and the latter limited to existing corridors where practical. The proposed resource management plan is consistent with the state's forestland protection policies, with one possible exception (see Forestry Program for Oregon Objective: Forest Protection in Appendix MM).</p>

Relationship of the PRMP to Statewide Planning Goals (continued)

Statewide Goal Number and Description	Consistency of Proposed Resource Management Plan
<p>5. Open Spaces, Scenic and Historic Areas, and Natural Resources - To conserve open space and protect natural and scenic resources.</p> <p>Programs shall be provided that will (1) Ensure open space, (2) Protect scenic and historic areas and natural resources for future generations, and (3) Promote healthy and visually attractive environments in harmony with the natural landscape character.</p> <p>The location, quality, and quantity of the following resources shall be inventoried:</p> <ol style="list-style-type: none"> Land needed or desirable for open space. Mineral and aggregate resources. Energy sources. Fish and wildlife areas and habitats. Ecologically and scientifically significant natural areas, including desert areas. Outstanding scenic views and sites. Water areas, wetlands, watersheds, and groundwater resources. Wilderness areas. Historic areas, sites, structures, and objects. Cultural areas. Potential and approved Oregon recreation trails. Potential and approved federal wild and scenic waterways and state scenic waterways. <p>Where no conflicting uses for such resources have been identified, such resources shall be managed so as to preserve their original character. Where conflicting uses have been identified, the economic, social, environmental, and energy consequences of the conflicting uses shall be determined and programs developed to achieve the goal.</p> <p>Based on the analyses of economic, social, environmental, and energy consequences to Goal 5 resources listed above, conflicting uses of (BLM-administered) lands and resources may be resolved by selection of three management options: (1) protect the resource site; (2) allow conflicting uses fully; or (3) limit conflicting uses. This is achieved by designating with certainty what uses and activities are allowed fully, what uses and activities are not allowed at all, and which uses are allowed conditionally, and what specific standards or limitations are placed on the permitted and conditional uses and activities for each resource site.</p>	<p>Natural, historic, and visual resources were considered in the development of the proposed resource management plan. Availability of mineral, aggregate, and energy sources would continue, but be somewhat limited. Timber and ecosystem management actions would impact natural and visual resources.</p> <p>Adverse impacts to visual resources, wildlife habitat, potential wild and scenic rivers and state waterways, and unique natural areas would be slight. Water areas, wetlands and watersheds would be protected. See chapter 4 for discussions. Also see Forestry Program for Oregon Objective: Forest Practices in Appendix MM for discussion of consistency with relevant sections of the Forest Practices Act and Rules.</p> <p>The proposed resource management plan attempts to balance conflicting uses in light of their consequences. Conflicting resource uses are most often resolved by protecting the Goal 5 resource site or severely limiting conflicting uses to meet environmental goals.</p> <p>Even without any tradeoffs to enhance or maintain the existing commercial forest program, tradeoffs would be necessary between Goal 5 resource values. For example, mineral and aggregate resource or energy source access and development frequently conflict with all other Goal 5 values, and strict guidelines for the management of designated or potential wilderness or federal wild rivers may virtually preclude development or active management to benefit other Goal 5 resource values.</p>

Statewide Goal Number and Description	Consistency of Proposed Resource Management Plan
6. Air, Water and Land Resources Quality - To maintain and improve the quality of the air, water, and land resources of the state.	The federal and state water quality standards would be met and water quality would be maintained and/or improved. See Effects on Water Resources for discussion. Burning would have a potential effect on air quality, but without prescribed fire, the effects of wildfires on air quality would increase. The proposed resource management plan would comply with the Oregon Smoke Management Plan and the state implementation plan. See Effects on Air Quality for discussion. Also see Forestry Program for Oregon Objective: Forest Practices in Appendix MM for discussion of consistency with relevant sections of the Forest Practices Act and Rules.
7. Areas Subject to Natural Disasters and Hazards - To protect life and property from natural disasters and hazards.	Natural hazard areas, particularly floodplains and areas with highly erosive soils have been identified. The proposed resource management plan provides for appropriate management of natural hazard areas. BLM-authorized developments within natural hazard areas would be minimal, with project construction engineering reflecting site-specific conditions and requirements.
8. Recreational Needs - To satisfy the recreational needs of the citizens of the state and visitors and, where appropriate, to provide for the siting of necessary recreational facilities including destination resorts. Federal agency recreation plans shall be coordinated with local and regional recreational needs and plans.	The BLM actively coordinates its recreation and land use planning efforts with those of other agencies to establish integrated management objectives on a regional basis. Opportunities would be provided to meet recreation demand (identified in Oregon's Statewide Comprehensive Outdoor Recreation Plan). Projected demand for all activities on BLM-administered lands would be met under the proposed resource management.
9. Economic Development - To provide adequate opportunities throughout the state for a variety of economic activities vital to the health, welfare, and prosperity of Oregon's citizens.	See Effects on Recreation for further discussion. There has been no specific interest in development of destination resort sites on BLM-administered lands.
9. Economic Development - To provide adequate opportunities throughout the state for a variety of economic activities vital to the health, welfare, and prosperity of Oregon's citizens.	The proposed resource management plan would support reduced levels of BLM resource dependent employment and payments to counties, due to diminished timber production. Employment in rural areas would be most affected. See Effects on Socioeconomic Conditions for further discussion.
11. Public Facilities and Services - To plan and develop a timely, orderly and efficient arrangement of public facilities and services to serve as a framework for urban and rural development.	BLM-administered lands may be made available for development of public facilities or services by other parties, if the action would be permitted under the local government comprehensive plan and land use regulations, and relevant state setting requirements.

Relationship of the PRMP to Statewide Planning Goals (continued)

Statewide Goal Number and Description	Consistency of Proposed Resource Management Plan
12. Transportation - To provide and encourage a safe, convenient and economic transportation system.	The proposed resource management plan provides for accommodation of identified transportation needs, particularly for transportation of timber where not in conflict with Endangered Species Act requirements, but setting a major new transportation route (e.g., state highway) would require a plan amendment. Major utility corridors were considered and would be designated. The proposed resource management plan supports state policy objectives to restrict use of BLM roads for access to nonresource development that would be inconsistent with state planning goals.
13. Energy Conservation - To conserve energy.	Conservation and efficient use of energy sources are objectives in all BLM activities. Although the proposed resource management plan finds some additional rivers suitable for inclusion in the National Wild and Scenic River System, which would restrict the possibility of development of their hydroelectric potential, there are no pending development proposals and those rivers are considered to have low potential for hydroelectric use. Firewood sales would be permitted but firewood availability would be limited by allocation of substantial acreage to limited or no timber harvest.

Statewide goals: 10. Housing; 14. Urbanization; 15. Willamette River Greenway; 16. Estuarine Resources; 17. Coastal Shorelands; 18. Beaches and Dunes; and 19. Ocean resources are not applicable to Roseburg District BLM Planning Area.

Appendix OO

Timber Supply Analysis For BLM Planning

Background

In 1992, the USDI Bureau of Land Management released Draft Environmental Impact Statements (EIS) for the Coos Bay, Eugene, Medford, Roseburg, Salem, and Klamath Falls Resource Area - Lakeview District Draft Resource Management Plans. These drafts included a comprehensive analysis of timber supply in western Oregon. The analysis covered a period of initial plan implementation (1991-2000) and the period thereafter (2001-2010). The baseline period that provides a historical benchmark for comparison was 1984-1988.

Details of the original analysis are described in the draft EISs. Regional stumpage price results were used to calculate price changes for the assessment of personal income, employment, and population effects. Harvest and log consumption results are presented in chapter 4.

Key Concepts

Implemented on all Districts, each set of similar resource management plan alternatives represented a different timber supply policy, or alternative theme, for USDI Bureau of Land Management (BLM) administered lands in western Oregon. The question being addressed by this analysis is how do changes in BLM timber supply policy affect how much timber is harvested and consumed in various parts of western Oregon? Western Oregon was divided into subregions that differed in ownership distribution, private timber availability, and silvicultural management, while at the same time served as logical reporting areas for western Oregon BLM Districts. Changes in one subregion could affect another through the transportation of logs from harvest origin to processing destination. The analysis recognized that the BLM is just one timber supplier within western Oregon and that the impact of harvest changes is felt where the timber is actually consumed. The amount of timber offered for sale by the BLM affects stumpage price. In turn, stumpage price influences private timber harvest. The lower the BLM sale quantity, the higher stumpage prices, and the higher the level of private timber harvest.

Timber demand is determined by factors outside the control of the BLM such as housing starts and other national economic variables like gross domestic product and the interest rate. Year to year fluctuations in timber demand were averaged over a ten year period. Timber supply is determined by ownership, location, and stand condition. Ownership determines the policy specifying the conditions under which the timber may be harvested. Location accounts for variations in species composition and the amount of timber available for harvest. Stand condition measures the amount of harvestable volume available on a per acre basis, as well as the growth rate and stage of development of this volume. Private timber harvest is directly proportional to stumpage prices. This analysis accounted for changes in private timber supply by assessing inventory conditions at the beginning of each analysis period. For public agencies such as the USDA Forest Service and the BLM, timber supply is fixed at the planned allowable sale quantity; regardless of the stumpage price.

Market equilibrium defines a balance between timber supply and demand: the amount of timber harvested equals the amount of timber consumed at the market clearing price. Implementing a new BLM timber policy will disrupt this balance and leads to adjustments in the stumpage price such that a new timber supply and demand balance is created. In this analysis, market equilibrium is explicitly recognized for the Pacific Northwest - westside region, and this implies a local equilibrium within each western Oregon subregion.

Updated Procedures

As was the case in 1992, the analysis consisted of the following steps for the 1991-2000 period¹: (1) regional market equilibrium, (2) disaggregation of the private harvest, (3) timber harvest by ownership, (4) reapportioning harvest into log consumption; and for the 2001-2010 period, (5) updating the private inventory, projecting the private harvest, and re-estimating log consumption.

¹ See Draft Environment Impact Statement (1992) for a detailed description of each step.

Timber Assessment Market Model (TAMM) (Adams and Haynes 1980, Haynes 1990) run² results for the 1992 analysis indicated a linear relationship between private timber supply and BLM alternative sale quantity (Anonymous, 1992). This analysis relied on interpolating the results from two updated TAMM runs representing Federal timber supply levels of 187 million cubic feet per year (mmcf/year) and 322 mmcf/year respectively. The first run³ corresponds to the Resources Planning Act (RPA) base run used to evaluate the Forest Plan for "Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl". The second run⁴ represented an arbitrarily set higher level of Federal timber supply. The interpolations were based on changes in the BLM share of the Pacific Northwest - westside Federal timber supply for the alternative theme being analyzed. National Forest harvest levels were held at their level in the 1994 RPA base run (93 mmcf/year). The other public harvest for the Pacific Northwest - westside supply region was left unchanged at 147 mmcf/year.

When compared to the base run used in the 1992 analysis⁵, the April 1994 RPA TAMM base run included several updates relevant to the Pacific Northwest - westside supply region⁶. The most relevant was an overall reduction in private timber supply due to inventory updates. This had the effect of lowering TAMM's estimate of private growing stock removals given similar policy and economic conditions used in the 1992 analysis. Other TAMM updates included revisions in historical input data for revised estimates of the proportion of sawtimber volume from growing stock removals. Observed harvest values for the years 1991 and 1992 replaced estimates used in the 1992 analysis.

The procedures and assumptions used to complete steps (2) - (5) above remained the same as those used in the 1992 analysis (see Draft EIS, 1992).

Results and Discussion

Results are presented in Tables 00-3. When compared with the 1992 analysis, the results indicate an overall lower level of private timber supply under higher stumpage price levels. The higher stumpage

prices reflect the markedly lower level of timber supply from National Forests. In the 1992 analysis, National Forests were held at a supply level of 240 mmcf/year (consistent with their proposed plan modifications under the Interagency Scientific Committee conservation strategy for the northern spotted-owl). However, under implementation of the President's Forest Plan, the National Forest timber supply is reduced to 93 mmcf/year. In spite of this price increase, the level of private harvest is lower than estimated in the 1992 analysis. This reflects the private inventory updates in TAMM.

When compared to the 1984-1988 baseline, the private harvest under each BLM alternative theme increases over 1991-2000. This can be attributed to increases from the non-industrial private ownership. Comparison of the 2001-2010 projections with the 1991-2000 harvest disaggregation shows a dramatic increase in the total private harvest, over 130 million cubic feet per year. One important qualification for this harvest gain is that pre-1990 forest practice rules and related environmental constraints on the private timberlands remain unchanged through 2010. Therefore, these increases may not be entirely attainable given recent changes in Oregon forest practice regulations for stream protection and proposed conservation restrictions on private lands for the marbled murrelet, northern spotted owl, and possibly coho salmon.

Western Oregon was a net importer of logs over the 1984-1988 period as total consumption exceeds harvest. This was not allowed to vary in this analysis. Differences in log consumption across BLM resource management plan alternatives were less noticeable given the large share of timber harvest still forthcoming from all other ownerships. For all BLM resource management plan themes, log consumption in western Oregon is projected to decrease when compared to the 1984-1988 baseline period. Most of this decrease is from reduced National Forest allowable timber sale quantities under the President's Forest Plan and TAMM reductions in private timber availability. Private harvest increases in the 2001-2010 period translate into higher levels of consumption for this period.

² TAMM90 log runs 582, 583, 584, and 587.

³ Timber Assessment Market Model - 1993 Montana Version, LR-207 (RPA-Base, 4/14/94).

⁴ Timber Assessment Market Model - 1993 Montana Version, Log Run CT2, June 24, 1994.

⁵ TAMM90, Log-Run 581, April 9, 1992.

⁶ R. Haynes, and J. Mills. Social and Economic Values Research Program, USDA Forest Service, Pacific Northwest Research Station, Portland Forestry Sciences Laboratory, PO Box 3890, Portland, Oregon, 97208.

Table OO-1. Regional Market Equilibrium Results by BLM Resource Management Plan Theme

Bureau of Land Management		Timber Supply Analysis Results	
Resource Management Plan Theme	Allowable Sale Quantity (mmcf/year)	1991-2000 Regional Stumpage Price (1982 \$/mbf)	1993-2000 Western Oregon Private Growing Stock Removals (million cubic feet per year)
1984-1988 Historical	199	\$112.42	602
NO ACTION	187	\$255.63	618
A	250	\$250.41	610
B	224	\$252.53	613
C	67	266.05	635
D	74	\$264.94	633
E	56	\$267.07	637
PRMP	35	\$268.86	640
TAMM LR-207	94	\$263.64	631
TAMM LR-CT2	136	\$251.85	612

mbf - thousand board feet, long log scale.
mmcf/year - million cubic feet per year.

Table OO-2. Results for the 1993-2000 Private Harvest Disaggregation and 2001-2010 Harvest Projections

BLM Resource Management Plan Theme	Private Harvest, Western Oregon (million cubic feet per year)					
	1993-2000			2001-2010		
	IND	NIPF	TOTAL	IND	NIPF	TOTAL
PRMP (BLM ASQ = 35)	465	175	640	558	213	771
No Action (BLM ASQ = 187)	449	169	618	549	208	757
Alternative A (BLM ASQ = 250)	443	167	610	545	206	751
Alternative B (BLM ASQ = 224)	446	168	614	547	207	754
Alternative C (BLM ASQ = 67)	461	174	645	556	212	768
Alternative D (BLM ASQ = 74)	460	174	634	555	211	766
Alternative E (BLM ASQ = 56)	462	175	637	556	212	768
Timber Availability ⁽¹⁾ (BLM ASQ = 190)	544	125	669	557	125	682
	IND	NIPF	TOTAL			
1984-1988 Baseline (BLM Harvest = 202)	525	77	602			

Notes: PRMP - Proposed Resource Management Plan
 IND - Private industrial ownership.
 NIPF - Private non-industrial ownership.
 BLM ASQ - Bureau of Land Management resource management plans cumulative allowable sale quantity for western Oregon (million cubic feet per year). Includes the Klamath Resource Area of the Lakeview District.
 BLM Harvest - Bureau of Land Management actual harvest (million cubic feet per year).

⁽¹⁾ Sessions, John., coordinator. 1990. Timber for Oregon's tomorrow. The 1989 update. Corvallis, OR. Oregon State University, College of Forestry, Forest Research Lab. 183 p.

Table OO-3. Log Consumption Results by BLM Resource Management Plan Theme

BLM Resource Management Plan Theme	Log Consumption by Western Oregon Processing Facilities (million cubic feet per year)							
	1993-2000				2001-2010			
	HARV	END CNSMP	EXOG CNSMP	TOTAL CNSMP	HARV	END CNSMP	EXOG CNSMP	TOTAL CNSMP
PRMP	797	761	97	858	928	882	97	979
No Action 929	890	98	987	1,067	1,018	98	1,115	
Alternative A	982	942	97	1,039	1,123	1,072	97	1,170
Alternative B	961	922	97	1,019	1,101	1,051	97	1,148
Alternative C	825	789	97	886	958	911	97	1,008
Alternative D	831	794	97	892	964	917	97	1,014
Alternative E	816	779	97	876	947	900	97	997
	HARV	END CNSMP	EXOG CNSMP	TOTAL CNSMP				
1984-1988 Baseline	1,248	1,196	98	1,294				

Notes: PRMP - Proposed Resource Management Plan
HARV - Total harvest from all ownerships within western Oregon (million cubic feet per year).
END CNSMP - Consumption of logs originating from ownerships within western Oregon (million cubic feet per year). The difference between HARV and END CNSMP represents the volume of timber originating in western Oregon, but processed by out-of-state or eastern Oregon mills.
EXOG CNSMP - Consumption of logs originating from ownerships from eastern Oregon and out-of-state (million cubic feet per year). Differences reflect the effect of implementing different BLM resource management plan alternatives on Klamath Resource Area of the Lakeview District in eastern Oregon.
TOTAL CNSMP - Total log consumption (all origins) by western Oregon processing facilities (million cubic feet per year).

Appendix PP

Timber Harvest and Management Details, Proposed Resource Management Plan

Table PP-1. PRMP Planned Harvest by Sustained Yield Unit (MMCF and MMBF harvest estimates per decade)*

Sustained Yield Unit	Decade									
	1st		2nd		3rd		5th		10th	
	MMCF	MMBF	MMCF	MMBF	MMCF	MMBF	MMCF	MMBF	MMCF	MMBF
South Umpqua	23	137	23	138	23	137	23	133	23	133
Douglas	47	316	47	309	47	289	47	282	47	290
District Total	70	453	70	447	70	426	70	415	70	423

*Estimates summarized from TRIM-Plus Harvest files may differ slightly from Ten-Year Scenario derives statistics.

Table PP-2. Expected PRMP Harvest by Allocation and Management Stage (modeled acres and volume per decade)*

	1st		2nd		Decade 3rd		5th		10th						
	Acres	MMCF	MMBF	Acres	MMCF	MMBF	Acres	MMCF	MMBF	Acres	MMCF	MMBF			
Connectivity Areas															
Regeneration Harvest	1,920	6.2	40	1,905	9.0	58	1,899	9.7	63	1,898	11.1	72	1,921	13.0	83
Density Management	1,655	1.9	12	763	2.3	12	2,872	8.5	43	3,008	9.0	50	105	.2	1.3
General Forest Management Areas															
Regeneration Harvest	9,955	60.2	392	9,288	56.7	367	7,909	49.3	306	5,082	46.1	272	3,353	38.2	235
Commercial Thinning	844	1.6	8	984	1.9	10	1,160	2.4	14	2,039	3.7	21	8,191	18.5	103
Totals															
Regeneration Harvest	11,875	66.4	432	11,193	65.7	425	9,808	59.0	369	6,980	57.2	344	5,274	51.2	318
CT & Density Management	2,499	3.5	21	1,747	4.2	22	4,032	10.9	57	5,047	12.7	71	8,296	18.7	105
Combined Harvest Activities	14,374	69.9	453	12,940	69.69	447	13,840	69.9	426	12,027	69.9	415	13,570	69.9	423

*Acreage and volume estimates summarized from TRIM-Plus inventory and Harvest files.
 First decade estimates may differ slightly from other Preferred Alternate statistics derived from the Ten-Year Scenario process.

Table PP-3. PRMP Assumed Average Annual Stand Treatments by Decade (Acres)

Treatment	1st	2nd	Decade 3rd	5th	10th
Plant Genet. Selected Stock	11,400	12,090	10,590	6,980	5,590
Competing Vegetation Control	9,440	7,830	6,860	4,520	3,620
Precommercial Thin (PCT)	37,790	6,720	5,890	3,880	3,110
Fertilization	14,400	9,000	5,580	10,070	5,820
Pruning	4,600	13,600	2,420	1,140	1,400